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Aquaculture in Massachusetts

a strategic plan for industry growth and job creation

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Aquaculture in Massachusetts

a strategic plan for industry growth and job creation

Compiled by:

The Cape Cod Resource
in conjunction with
The Massachusetts Aquaculture Association
Karl Rask
Alice Boyd
Kenneth Bergstrom

[illegible]

Funded by
The Commonwealth of Massachusetts
Executive Office of Communities and Development
and
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> *"By the year 2000, nearly one-quarter of global seafood consumption will come from fish farming. In order to keep pace with rising demand for seafood, world aquaculture production must double by the end of this decade and increase seven-fold in the next 35 years. This estimate is based on current population projections and assumes a stable wild fishery harvest. The important question is whether U.S. aquaculture will share in this explosive growth."*
>
> Senator Daniel Akaka, Hawaii, 1995

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EXECUTIVE SUMMARY

Aquaculture in Massachusetts has developed rapidly in the last ten years. Increased demand for high quality aquacultured products, coupled with the current fisheries crisis combine to create opportunities for aquaculture that were previously nonexistant. Although methods and markets are well established, regulations and the political structure must change in order for this industry to develop further. Investment capital has been leaving Massachusetts for more favorable business climates for quite some time, and this will continue to occur unless conditions are improved.

The aquaculture industry at this time is composed of shellfish culture in the southeast region, as well as freshwater fish culturists located across the state. These are two very distinct groups, with very different requirements and obstacles. Both segments have tremendous growth potential, but are severely limited by the existing regulatory structure. Regulatory reform needs to occur if the industry is to grow and flourish.

Massachusetts currently produces approximately $8 million in aquaculture products per year. Gross sales are expected to increase at least 40% by 1996. If the recommendations put forward in this plan are implemented, it could mean a five fold increase is possible in the next five to seven years.

Aquaculture is an environmentally compatible industry, which can provide employment in areas where few other opportunities exist. A thriving aquaculture industry would be beneficial to the entire Commonwealth economy, with an economic multiplier factor of almost five times for each dollar farm gate value. In order for aquaculture to develop further, state agencies need to have a proactive and helpful role. Progress can be made by evaluating and adopting effective models already in place in other states and countries. This document has attempted to compile appropriate recommendations successfully implemented elsewhere.

As a number of agencies are presently involved in an aquacultural planning effort, this presents an unprecedented opportunity for a cooperative working relationship with industry. A new framework for interaction is needed, which focuses on problem solving with shared common objectives. A structure needs to be established for conflict resolution and communication, with the agencies in a proactive mode. Although this is not currently the case, much can be done by the agencies if they work cooperatively with the private sector on resolving issues that unnecessarily restrict an environmentally benign activity.

Massachusetts is about ten years behind the leading aquaculture states, but has the opportunity to leap ahead with the adoption of the recommendations included in this plan. Many of the recommendations have already been made in other states, and have been implemented in states now leading the aquaculture industry. This plan makes use of other states successes, providing a tried and true plan for industry growth in Massachusetts. The industry encourages the Commonwealth of Massachusetts to take action; which will in turn create jobs and significantly add to our states economic base.

The recommendations included in this document have been developed in close cooperation with the Massachusetts Aquaculture Association, representing growers who account for over 90% of the product value in the state. There are numerous immediate needs of existing growers which need to be addressed, in addition to longer term needs that can be predicted but are not immediately affecting business development. Over 40 recommendations have been developed which if implemented would significantly enhance the industry. A brief summary is provided here, focusing on solutions to existing concerns. It is essential that the immediate needs be acted upon. The current situation is restrictive for established operations, and these same problems are limiting the establishment of new operations.

DEFINITION:

''Aquaculture'' means that form of agriculture devoted to the propagation, culture, and husbandry of aquatic or marine plants and animals in marine, brackish, and fresh water. This definition does not include hydroponics.

Culture implies some form of intervention in the rearing process, such as regular stocking, feeding, protection from predators, etc... Culture also implies individual or corporate ownership of the stock being cultivated.

Federal Aquaculture Development Strategy, Canada, and United Nations FAO

Summary of General Recommendations

1. Streamline the initial permit process with a general ''one-stop'' procedure. This is currently under development by the existing agency sub-committees. Streamlining should include concurrent time lines for all involved agencies, requiring simultaneous review.

2. Designate ''Lead Agency'' status to the Department of Food and Agriculture. This action will result in the development of aquaculture as an agricultural industry. The Lead Agency will be a proactive advocate of industry, and be available to assist growers as appropriate.

   a. Define the term aquaculture as a form of agriculture.
   b. Recognize aquacultural commodities as agricultural commodities.
   c. Evaluate the inclusion of the term "aquaculture" into existing laws pertaining to agriculture.

DEFINITION:

"Aquaculture facility" Any facility, hatchery, pond, lake, stream, or any other waters in which fish or shellfish are held, raised, and produced for sale. In the case of shellfish grants, the facility includes the entire licensed grant area.

3. Fund a full time Aquaculture Coordinator within the Department of Food and Agriculture as the Lead Agency. This individual should have strong industry background and understand problems and needs facing growers. The Aquaculture Coordinator should work with the applicant and the respective agencies in an advocacy and assistance role, especially in the areas of permitting and technical assistance.

4. Develop an industry oriented Aquaculture Commission, with the primary function of problem solving, conflict resolution, and expediting the review/permitting process. A cooperative partnership is needed between industry and the various involved agencies. This Commission should have strong industry representation from all sectors including shellfish, finfish, and recirculating systems. The Commission would report to the Commissioner of Food and Agriculture. This would provide a long term solution to conflict resolution, in which all the participants share the same goals.

5. Establish stable research and development funding for the Massachusetts Aquaculture Innovation Center, modeled after the Maine Aquaculture Innovation Center. The MAIC is a state assisted, but industry driven research and development center. Maine established three such centers in 1989 to expand cooperative efforts between industries and the research community. This approach has proven itself to be very responsive to industry needs while maintaining a balanced representation from government and industry. Funding for research and technology development are critical. Such a commitment would not only address immediate priority needs , but also attract matching funds from other sources.

> *"The state has to define its goals, in the same way a manufacturing or engineering company has to determine the best product for its markets. The marketing and management staff have to work cooperatively with engineering and design staff, to develop and deliver the most competitive product. There has to be an overview of quality assurance to ensure that the customer gets what the business says they will deliver. The same total quality management standards would improve the efficiency of the state agencies. The agencies are not even coming close to this."*
>
> Carl Breivogel, Trout Producer, Falmouth

IMMEDIATE NEEDS FOR SHELLFISH CULTURE

1. Amend the shellfish culture statute, Ch. 130, sec. 57 to provide for the guaranteed right of renewal for shellfish licenses.

2. Amend Ch. 130, sec. 57, to provide for the sale, transfer, or heritability of a shellfish license at the discretion of the license holder.

3. The Commonwealth should assert its jurisdiction of ownership of lands below mean low water. Amend Colonial Ordinance to "mean low water".

4. Tidelands rights issues must be clearly defined. Private tidelands should be assessed and taxed.

5. Division of Marine Fisheries remain the regulatory agency (Ch.130, Sec. 57) with new funding for one FTE Aquaculture Staff responsible for permitting, site survey, technical assistance.

6. Conditionally closed areas should be made available for the one year nursery culture of seed shellfish.

FINFISH

1. Freshwater aquaculture policies currently in effect need to be responsive to industry, including policies on permitting, species selection, and fish health management. Alternate fish health policy endorsed by the United States Trout Farmers Association and each of the 12 aquaculture associations in the northeast should be utilized.
2. Add one member of the Massachusetts Aquaculture Association to the Fish and Wildlife Advisory Board.
3. Create an Aquaculture Disease Committee to address fish health concerns.
4. Adopt the existing permitting procedures in effect in the State of Maine for marine net pen operations. Rapidly developing improvements in environmental monitoring protocol currently being evaluated in Europe should also be utilized.
5. Support the creation of a Massachusetts based aquaculture feed production facility.

FINANCIAL

1. The Executive Office of Economic Affairs should continue to fund Small Business Assistance programs to encourage industry growth.
2. Appropriate $5 million in new initiative funding for aquaculture development for the purpose of providing economic assistance to aquaculture businesses.

HIGHER EDUCATION AND EXTENSION

1. Enhance the higher education and Extension involvement in aquaculture, especially in the areas of research, technology transfer, and training.

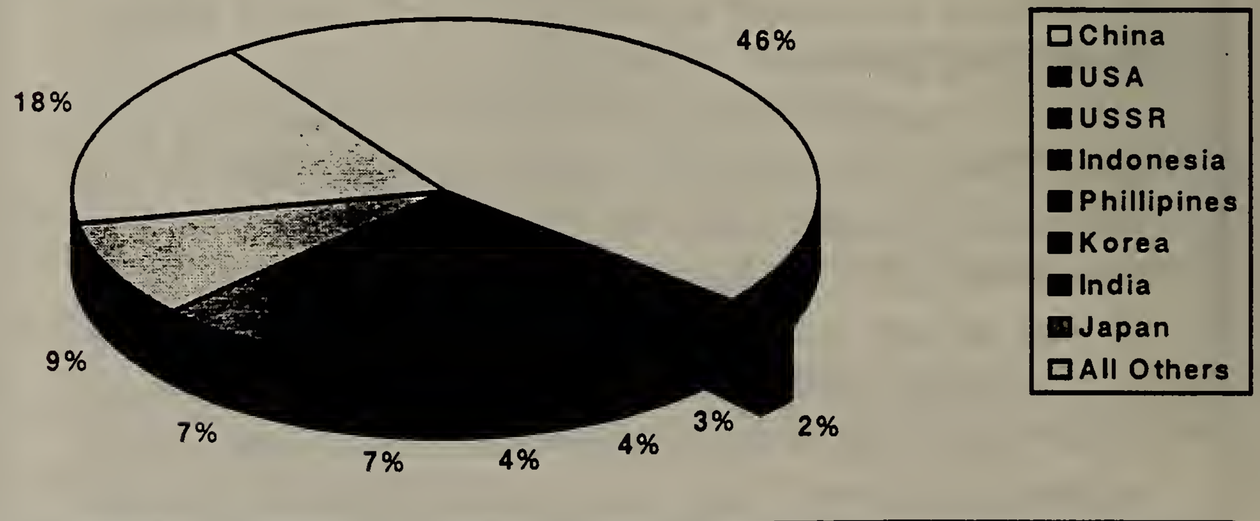
A number of specific issues are of immediate concern to existing growers. These require direct action, as the same obstacles are also preventing new businesses from becoming established. More importantly, an overall change in perspective and philosophy is needed within the state infrastructure in order for aquaculture to develop fully. A cooperative working relationship between industry and state agencies is needed, in which all parties have the same goals of facilitating the development of aquaculture industries statewide, without compromising environmental integrity or other aquatic uses. A like minded partnership between government and industry can effectively accomplish these goals, with long lasting benefits throughout the Commonwealth.

INTRODUCTION

Aquaculture has had a history in Massachusetts dating back over one hundred fifty years. In the 19th century shellfish were planted in beds which had been over harvested due to high demand. Trout were cultured because of a decline in the available catch in the local streams and rivers. The current emphasis on aquaculture has been heightened by the closing of George's Bank and the loss of fish related business and jobs. The recent peaked interest in aquaculture is directly related to the desire to replace lost fish resources and lost income to a depressed sector of the economy.

Aquaculture has the potential to create many new jobs and much new product for the Massachusetts economy, and has already done so in a number of other states that have recognized and acted upon the opportunities provided by this industry.

Nationally aquaculture is one of the most rapidly growing sectors of the economy and is the fastest growing agriculture segment, growing an average of 20 percent each year (USDA, 1991). In 1975, US production was only 78,000 tons. In 1990 aquaculture production exceeded 400,000 tons, and demand continues to increase. Consistency, perception of quality, and low risk of contamination are cited as reasons. Despite the significant annual increases here in the United States, fish and fish products, after petroleum, are the second largest segment of the US balance of trade deficit for all natural products at $4 billion dollars (USDA 1993). In 1991, 19% of all fish and seafood consumed globally was produced through aquaculture. US aquaculture production accounted for only 2% of the world aquaculture output in terms of tonnage and sales value (FAO 1991). The US is trailing the world in aquaculture production, and in spite of abundant marine and freshwater resources, Massachusetts is not one of the leaders in the United States.



Top Eight Aquaculture Producing Countries Based on 1990 Production

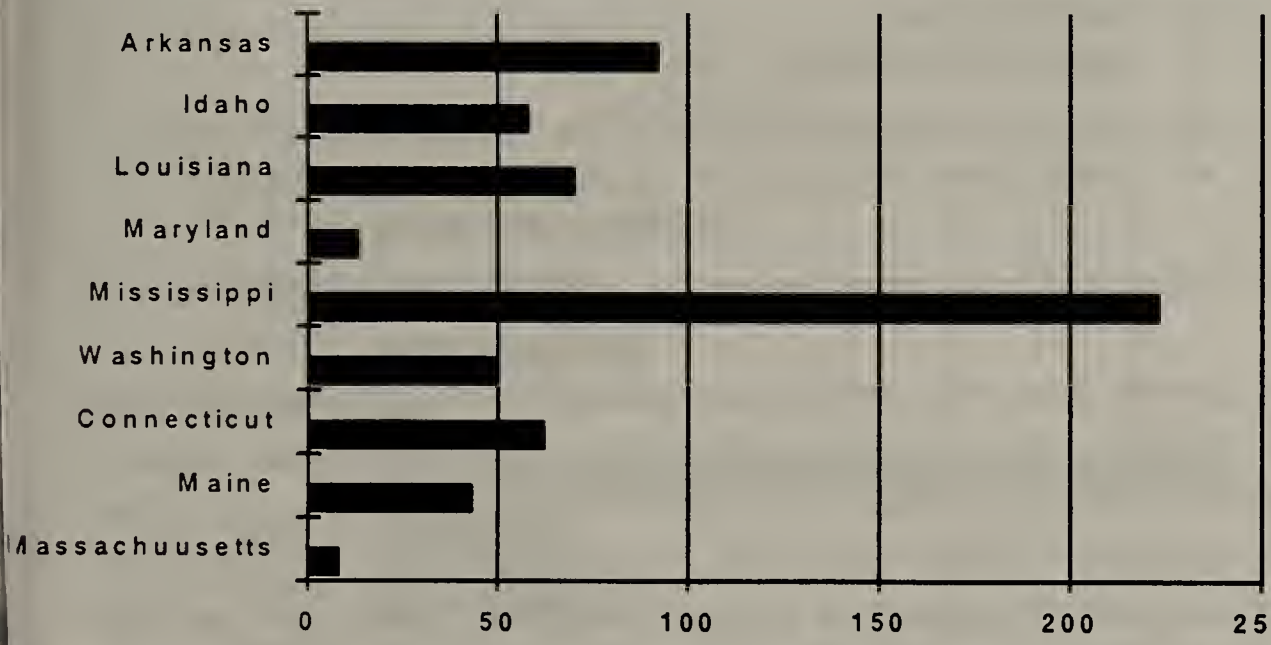
MASSACHUSETTS AQUACULTURE SITUATION

Massachusetts has abundant freshwater resources, as well as a lengthy coastline. Shellfish are the most valuable marine aquacultured product, as Massachusetts has some of the best shellfish growing area in the world. Cold clean waters provide an excellent product, that is internationally recognized. Although demand for the product is increasing, acreage available for shellfish culture is restricted. A complex overlay of regulation and property rights issues have stonewalled growth in many areas, even though business would thrive if allowed to become established.

Several factors have converged to create an ever increasing need for Massachusetts aquacultured products. Exponential global population growth and increased per capita consumption of seafood products, combined with a decimated Atlantic groundfishery, have created unprecedented regional and national demand. It is anticipated that US demand for aquacultured products will increase over 700% in the next 25 years (Davlin, 1992).

> *"Massachusetts has the ability and resources to produce the finest quality seafood in the world. Our laws and government structure must be overhauled and made applicable to current times in order for aquaculture to be attractive." Dick Nelson*
> Cotuit Oyster Company

Estimates of U.S. Aquaculture Value By State
($ Million)



Growers cannot even supply existing demand in today's market. In 1994 shellfish growers hired a marketing specialist to explore potential market opportunities. During his first day of employ, the Association received an order which the present supply was unable to fill. It became clear that increased supply would actually increase price, allowing growers to capture markets that are currently inaccessible due to inconsistent quantity of product available.

Massachusetts currently produces aquaculture products with a farm value of over $8 million and could expand into most of the markets that currently exist. Shellfish account for about 50% of this, with freshwater fish production, including closed recirculating systems, accounting for the other 50%. The potential for the development of the shellfish industry alone in Massachusetts is in excess of $20 million. The potential for enhanced fin fish production is present in both fresh and salt water and dollar estimates of the potential are of the same magnitude. If a suitable business environment is created the contribution which aquaculture makes to the Massachusetts economy could be well over $40 million direct farm value. The commonly used economic multiplier factor for aquaculture and fisheries products is five times, considering related support industries, distribution, and final retail sales. These figures do not take into account the value of sportfishing, which accounts for over $100 million/year in Massachusetts, or related tourism.

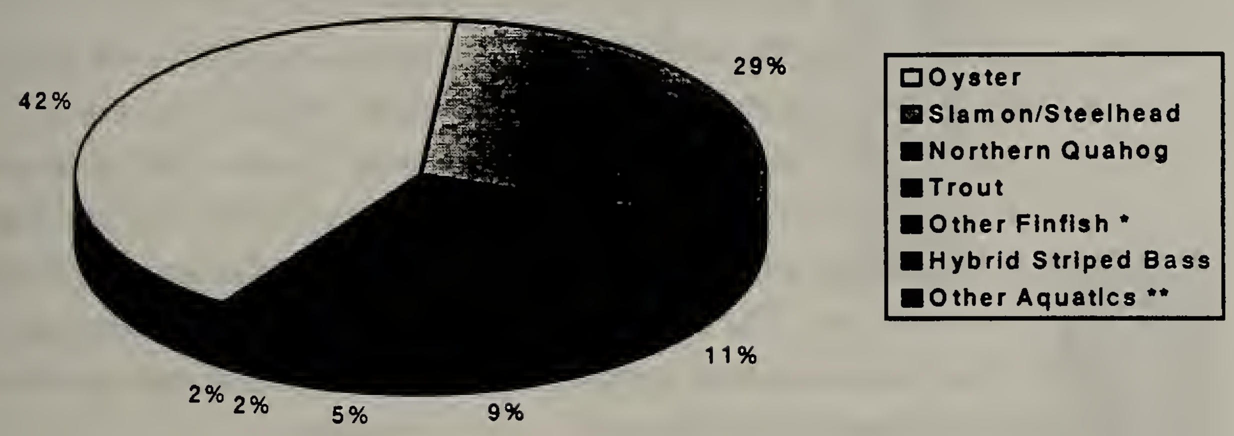
There are four very diverse segments of the industry which have separate needs, and equally diverse opportunities. These are:

- shellfish culture
- marine finfish culture
- freshwater fish culture, (ponds, flow through systems), and
- closed system finfish culture (both freshwater and marine)

Each of these will be addressed separately, as the issues vary significantly.

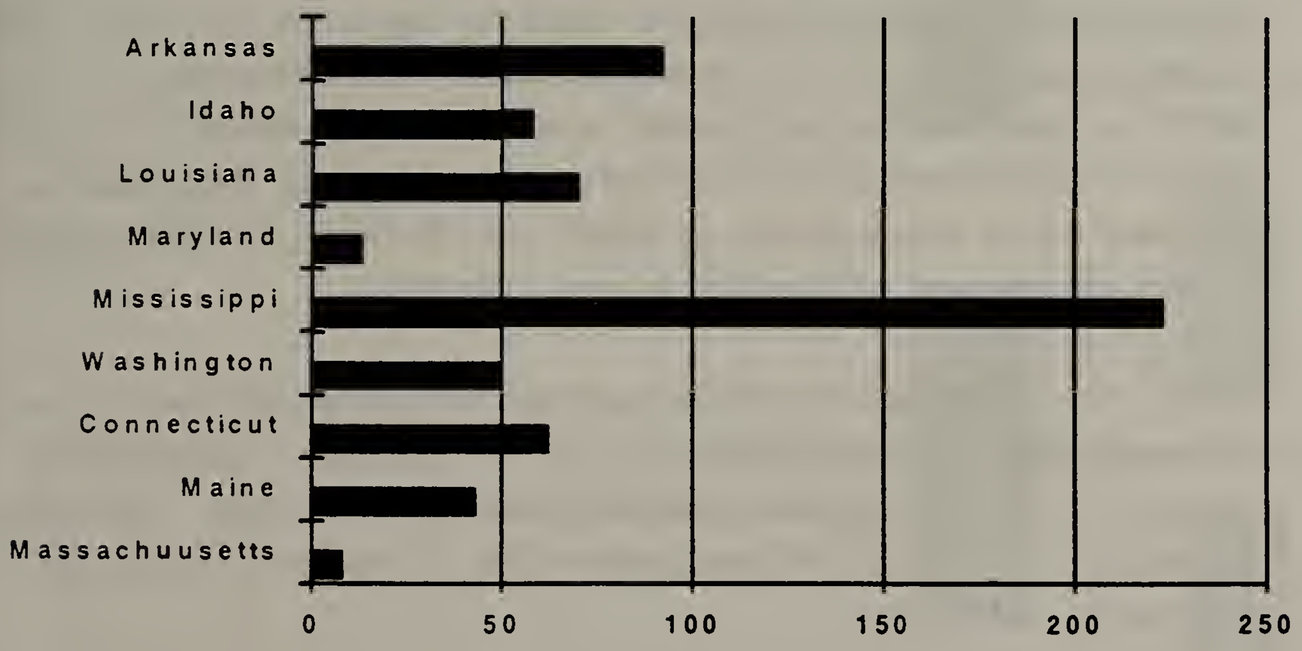
Meetings with producers statewide, accounting for 90% of the product base, have provided a clear blueprint for addressing immediate concerns. Many of these issues have been brought to the attention of agencies in the past, with no positive response. The Coastal Zone Management office (CZM) is now undertaking the development of an aquaculture development plan, as is the Division of Fisheries and Wildlife, which will focus on freshwater fish culture.

1992 Northeast U.S. Aquaculture Production
Farm Gate Value $146.4 Million (est.)



* Other Finfish = Tilapia, Catfish, Ornamental, Baitfish, Black Bass, Sunfish, Crappie, Perch
**Other Aquatics = Other Shellfish, Aquatic Plants, Crayfish

Estimates of U.S. Aquaculture Value By State
($ Million)



Massachusetts Aquaculture Association Recommendations

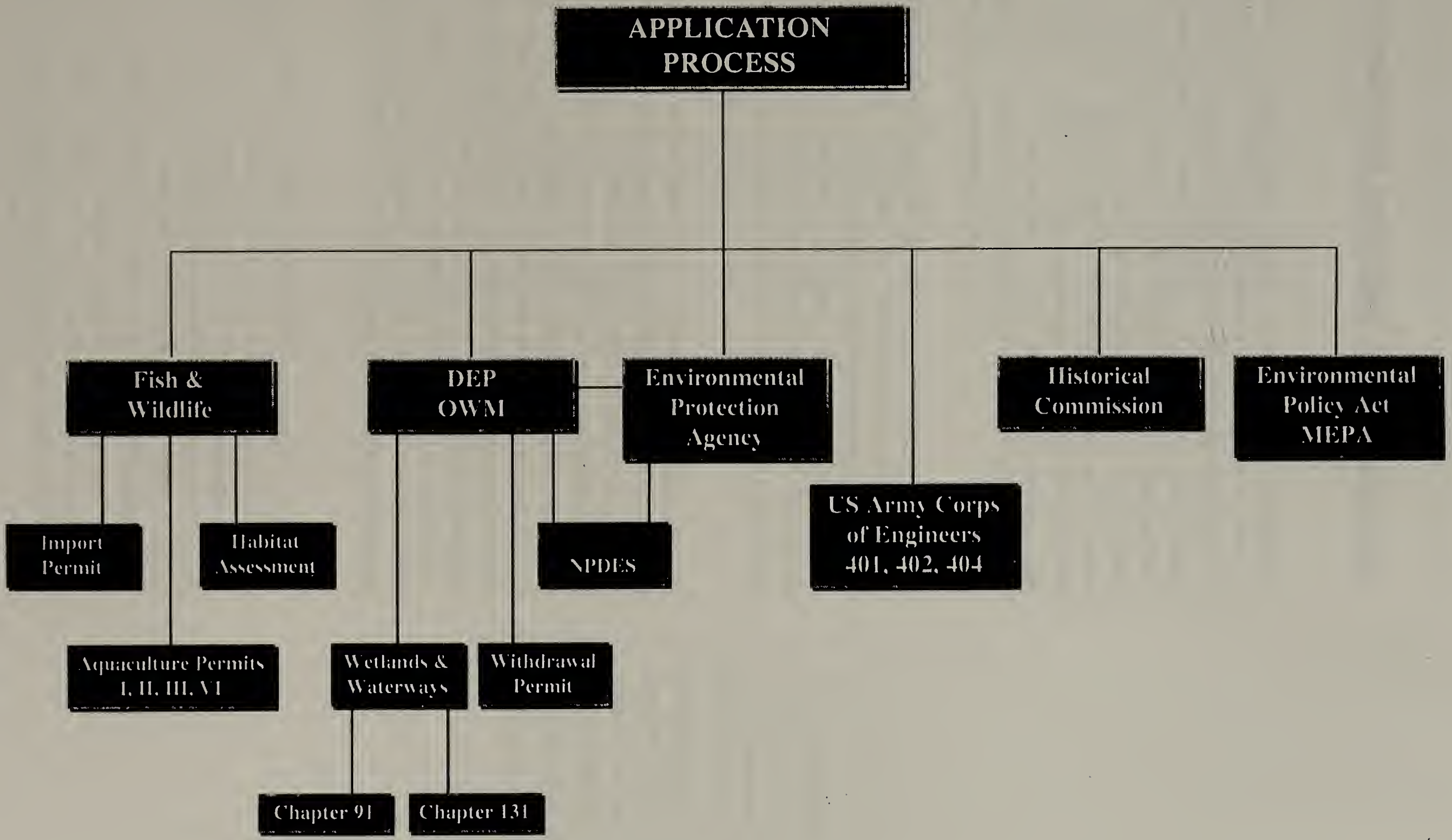
The Massachusetts Aquaculture Association (MAA) was created in 1986 by a group of fish and shellfish growers in an effort to provide support for each other in dealing with issues related to their new or expanding business. One of the major issues facing the budding industry was a regulatory environment which was not designed with aquaculture in mind. Over the last ten years the MAA has made gains in educating regulators and legislators regarding the nature of the aquaculture industry and the types of changes which must occur if the industry is to flourish. The MAA has urged the state to develop a plan which would promote the development of all aspects of aquaculture. The association is pleased to be leading in the development of this plan and is strongly in favor of its recommendations. The Association encourages the Legislature and the Administration to continue their support and expedite the implementation of the recommendations put forward herein.

''The object of the aquaculture strategy is to create an economic and regulatory environment in which aquaculture can prosper, while at the same time continuing to ensure environmental integrity.''
Brian Tobin, Canadian Minister of Fisheries

There are a number of potential situations that should be evaluated and planned for, should the industry grow as anticipated. Some situations are critical; others need not be prioritized immediately. For example, marine net pen culture has growth potential, but is not a critical priority at this time. Since there are no existing operations; adequate time can be provided to thoroughly investigate existing solutions. At the same time, immediate pressing concerns of the industry need direct attention, without further delay. Immediate concerns of existing producers need to be addressed, and are included in the recommendations to follow. Longer term issues related to growth will not be relevant unless the immediate short term problems are resolved.

Regulators and environmentalists are concerned that industry may in fact expand as predicted, and are working to create new regulations to "control" the spread of aquaculture, which is an environmentally compatible industry. The reality is that aquaculture will expand to meet the rising demand for fresh product, and that the expansion will occur in a favorable business environment. This may not be Massachusetts, in which case, investment capital and job creation opportunities will continue to move elsewhere.

There is an opportunity to provide a suitable business environment for an environmentally compatible industry, but this will require a working relationship between industry, regulators, and the investment community. This is the goal of this document, shared by members of the Massachusetts Aquaculture Association.


APPLICATION PROCESS
Fish & Wildlife
DEP OWM
Environmental Protection Agency
Historical Commission
Environmental Policy Act MEPA
US Army Corps of Engineers 401, 402, 404
Import Permit
Habitat Assessment
NPDES
Aquaculture Permits I, II, III, VI
Wetlands & Waterways
Withdrawal Permit
Chapter 91
Chapter 131

REGULATORY CONCERNS AFFECTING THE AQUACULTURE INDUSTRY

The current business climate for aquaculture is mixed positive and negative. There are tremendous opportunities for aquaculture development in both the marine and fresh water industries. There are also considerable obstacles in the form of regulations and lack of investment capital. The regulatory environment has led many investors to look elsewhere when seeking to invest in aquaculture. However the fact that strategic planning is being promoted by the Governors office, the Commissioner of the Department of Food and Agriculture and others is indicative of changes which are occurring which should benefit long term development of many types of aquaculture. If the recommendations put forth in this plan are adopted, Massachusetts will become an attractive and competitive site for aquaculture investment dollars.

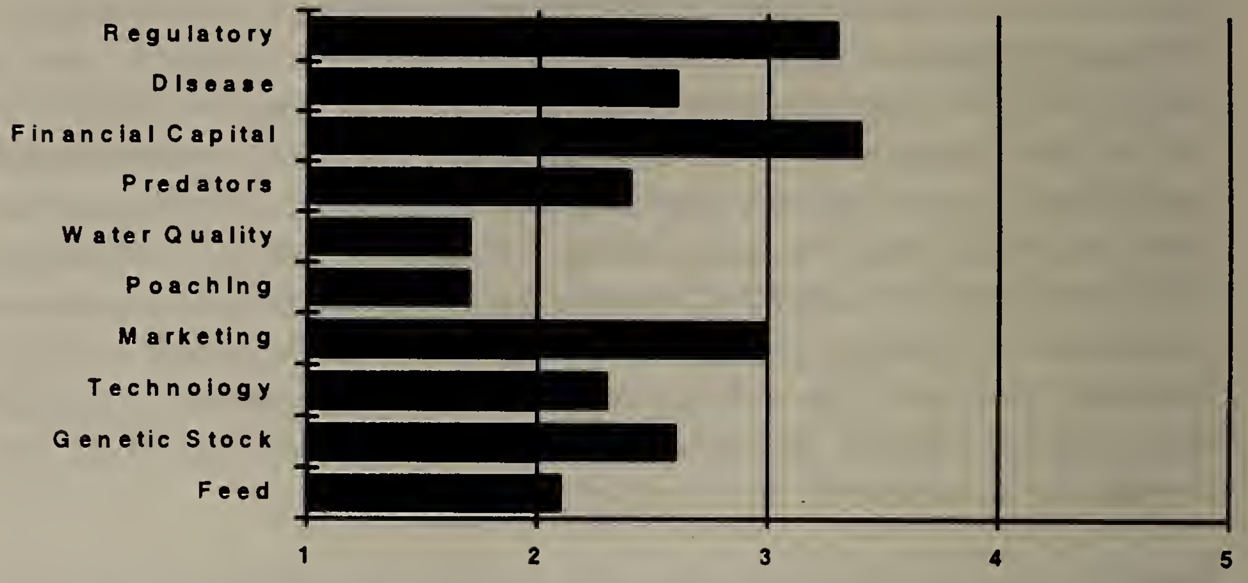
There has developed an anti-business posture in the regulatory community which is disguised as conservation activity. The regulatory environment in Massachusetts has undergone a shift in emphasis from conservation to preservation over the last 20 years. There has been a steady increase in restrictions over activities dealing with the natural resources of the Commonwealth. This change has had a major impact on business opportunities, for business like aquaculture, which depend on renewable natural resources.

When I'm told that it takes 30 days from the original application, and it actually takes 6 months to find out what is going on...there's a problem. There are two departments that are not communicating with each other or with the applicant."
Prospective Aquaculturist

Regulatory and Political Structure Regulations and permitting in Massachusetts are not yet responsive to needs of aquaculture producers. The Coastal Zone Management (CZM) office has outlined the permit procedure in a review document (CZM, 1995) and also recommends regulatory streamlining. The current application, review, and regulatory procedures do not lend themselves to industry growth. Many regulations were written with other concerns in mind (i.e. sewage treatment, industrial effluents, wild fishery management), and are not relevant in this context. For example, one grower was required to build his fish farm to earthquake specifications (Richter Scale 8). This is under the State Building Code, but would not be required of a dairy barn, greenhouses, or other agricultural structures. **Regulatory reform is clearly needed if any expansion is to occur.**

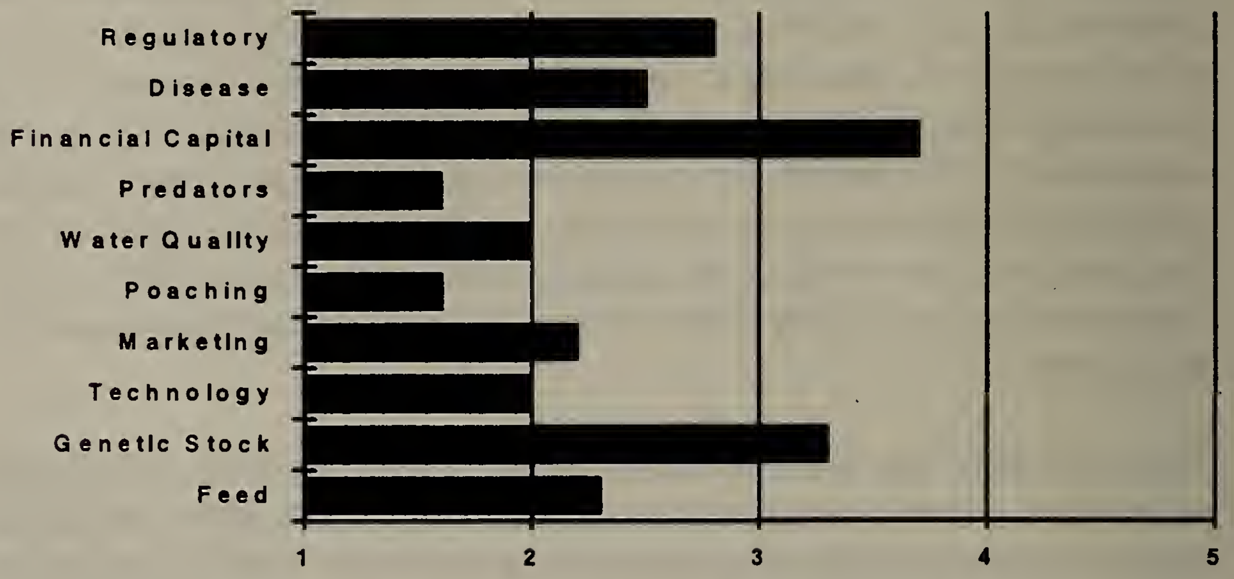
There are numerous agencies within Massachusetts involved in regulating aquaculture. Surveys of aquaculture producers nationwide show that regulations are generally cited as the most significant impediment to business growth. In Massachusetts, this is due to overlapping or conflicting agency jurisdiction, as well as regulations that were developed for other purposes, without aquaculture in mind. The existing regulatory structure is not favorable to aquaculture, and consequently, major sums of investment capital have relocated to other areas. Regulatory reform appears to be in progress via the aquaculture development subcommittees recently established, and will ultimately be helpful if industry input is considered as part of the process.

Hybrid Striped Bass Industry Constraints



1 = Not Constraining 2 = Slightly Constraining 3 = Moderately Constraining 4 = Very Constraining
5 = Totally Prohibitive

Tilapia Industry Constraints



1 = Not Constraining 2 = Slightly Constraining 3 = Moderately Constraining 4 = Very Constraining
5 = Totally Prohibitive

EXISTING POLICIES

California Aquaculture Development Act

x. The Legislature finds and declares that it is in the interest of the people of the state that the practice of aquaculture be encouraged in order to augment food supplies, expand employment, promote economic activity, increase native fish and shellfish stocks, enhance commercial and recreational fishing, and protect and better use the land and water resources of the state.

xx. The purpose of this chapter is to establish a policy and program toward improving the science and practice of aquaculture as a means of expanding aquaculture industry and related economic activity in the state.

xxx. As used in this chapter, ''aquaculture'' means the culture and husbandry of aquatic organisms, including, but not limited to, fish, shellfish, mollusks, crustaceans, kelp, and algae. Aquaculture shall not mean the culture and husbandry of commercially utilized inland crops, including, but not limited to rice, watercress, and bean sprouts.

Connecticut Aquaculture Commission

Connecticut developed their aquaculture development plan in 1986, forming an Aquaculture Commission within the Department of Agriculture. The Aquaculture Commission provided recommendations focused on assisting the existing industry as well as planning for future development. Through enhancing state agency capabilities, education, and the implementation of good farming techniques the industry has been revived to a $60,000,000/year industry.

In 1995, Connecticut will spend $60 million for a marine technology center at the University of Connecticut Avery Point Campus in Groton. Connecticut also has in place an effective aquacultural vocational educational program.

Canadian Federal Aquaculture Development Strategy

Canadian aquaculture production generates more than $289 million annually, employing 2,800, while supplies and services sector generates an additional $266 million, employing 2,400. Aquaculture is one of the few industries suited to revitalizing maritime provinces affected by the fisheries decline, and is expanding rapidly. Technologies as well as training models have been developed and are in place. The transfer of these innovations is the fastest and most efficient way to develop an analogous industry here in the US.

The Canadian Aquaculture Strategy was released earlier in 1995, with the intent to help Canada realize its potential to become a world leader in aquaculture. The Strategy creates Implementation Committees with representation from industry, academia, and all relevant agencies and departments. All will work together to identify developmental constraints and to assemble the expertise, technology and resources needed to find solutions quickly.

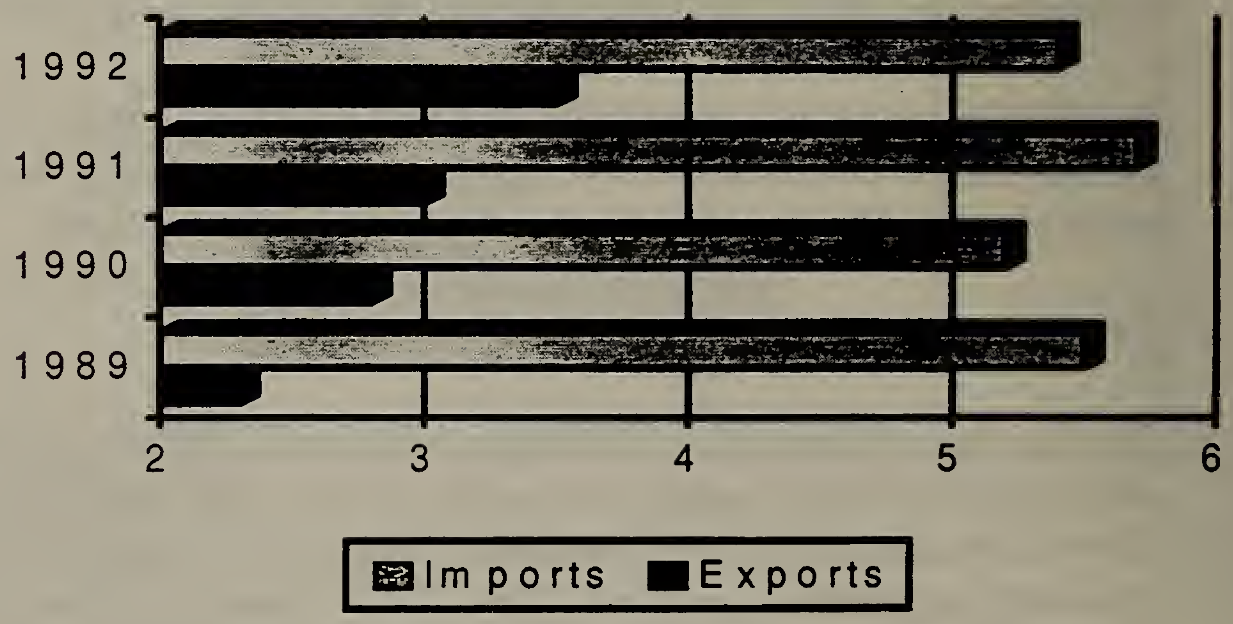
''The federal strategy is based on partnerships between industry and all levels of government.'' This is a key ingredient, as all players have the common goals of promoting aquaculture, finding solutions, and moving forwards with a national benefit in mind.

> *"...a number of critical success factors must be fulfilled for industry development to continue. Among these factors, coordination of support initiatives and removal of constraints are paramount if the full potential of the Canadian aquaculture sector is to be realized."*
> Canada Federal Aquaculture Development Strategy, 1995

Aquaculture in Norway

Norway, population 4.3 million, has 13,000 people employed in the aquaculture industry. The country supports over 800 farms and nearly 400 hatcheries. Aquaculture is recognized as an equal partner with the wild fisheries, and accounts for a full third of Norway's fish production. Norway's government has simplified regulations, but more importantly, advocates the industry at all levels from R&D on technical problems, to marketing the finished product. A government levy on exported fish supports a national marketing fund that spent $1 million on an internationally funded advertising campaign to boost salmon consumption in the US.

Value of U.S. Seafood Trade
($ Billion)



AQUACULTURE IS A FORM OF AGRICULTURE

For Aquaculture to flourish it is important to recognize it as a form of agriculture. By following the lead of other states and recognizing the intrinsic agricultural nature of aquaculture, it allows development and expansion of the industry with the assistance and support of the infrastructure already in place for other agricultural commodities.

Models and support systems are already in place either under USDA or the Massachusetts Department of Food and Agriculture for regulating disease, promoting and implementing development of proper husbandry techniques. Inspection services have been traditionally available through the Department of Agriculture. The Department of Agriculture historically acts as an advocate for industries which devote their energies to the raising of food products. In this capacity the department is able to transcend local politics and to take into consideration the greater good of protecting livestock resources from the spread of serious disease and to promote appropriate husbandry . The DFA has also been historically involved with the promotion and marketing of aquaculture products. DFA oversees the pesticide permit certification program for herbicides which are also used in the aquatic environment for managing weeds which affect ponds used for fish culture.

Aquaculture is inherently a form of agriculture, involving animal husbandry, the care and maintenance of livestock, and essentially most of the same practices utilized in land based agriculture. Strategies that have been used over the past 100 years to develop and expand agriculture could readily be used in similar ways for the aquaculture industry. Many concepts, such as poultry health management protocol, crop rotation schedules, juvenile rearing, and especially business management practices, can be transferred directly.

Recommendation: Designate Aquaculture as a form of Agriculture with the Department of Food and Agriculture as the Lead Agency responsible for aquaculture development and promotion.

Regulatory authority should remain within the Department of Fisheries, Wildlife, and Environmental Law Enforcement. However, this would provide a non-regulatory agency in a coordinating and assistance role, with the sole objective of assisting aquaculture, rather than regulating it. Regulatory agencies, by their very mandate, cannot serve both functions.

DEFINITION:

''Aquaculture'' means that form of agriculture devoted to the propagation, culture, and husbandry of aquatic or marine plants and animals in marine, brackish, and fresh water. This definition does not include hydroponics.

Culture implies some form of intervention in the rearing process, such as regular stocking, feeding, protection from predators, etc... Culture also implies individual or corporate ownership of the stock being cultivated.

Federal Aquaculture Development Strategy, Canada, and United Nations FAO.

"The legislation addressed some of the most pressing needs of aquaculture farmers, such as research, credit assistance, production and market data, conservation assistance, and better coordination among federal agencies. But the bill can best be summarized in a simple, three word statement: aquaculture is agriculture." Senator Daniel Akaka, Hawaii, 1995, discussing S.678, the National Aquaculture Development, Research and Promotion Act.

DEFINITION:
"Aquaculture facility" Any facility, hatchery, pond, lake, stream, or any other waters in which fish or shellfish are held, raised, and produced for sale. In the case of shellfish grants, the facility includes the entire licensed grant area.

Note that aquaculture is defined as a form of agriculture at the federal level and in most other states, and should be treated as such. This simplifies a number of questions that have already been successfully answered in the agricultural area. For example, there are significant regulatory differences between ''livestock manure'' and ''industrial waste''.

Recommendation: Evaluate the inclusion of the word ''aquaculture'' in each of the laws pertaining to agriculture, and amend those which are appropriate. Note that there are four distinct categories of aquaculture, both in marine and freshwater, which may have different requirements.

Recommendation: Create an Aquaculture Coordinator position within the Department of Food and Agriculture. This approach has been very successful, and it should be noted that most other states already fund such a position. There is also a National Association of State Aquaculture Coordinators (NASAC) which meets annually. Massachusetts would benefit greatly from utilizing this approach, provided that an individual could be found with strong industry and technical background. This is not a regulatory concept, but designed solely to have an individual in place that understands how things work, to act as a permit facilitator, the function being to assist producers and potential applicants with current problem solving. In addition to creating this position, it is imperative that industry be directly involved in the selection process.

Economic Impact of Streamlined Regulations

There are several economic ramifications to the existing permit process. In some cases, the project is denied and the investor goes to another state or country. This results in a loss of local employment, and an unnecessary increase in foreign importation. Under the best of circumstances, the permit process costs the applicant thousands in fees, and one to five years before getting the permit. The time required to secure a permit in Massachusetts is a significant

"By taking a proactive approach to this industry, we can virtually guarantee a leadership position in job development and in maintaining a continued supply of healthy food for our citizens."
Richard Todrin, Food Industry Consultant, Northampton, MA

barrier for investors and consistently discourages investment in our state.

The Massachusetts Aquaculture Association is routinely contacted by venture capitalists that have ready access to funds, are interested in aquaculture, and end up investing significant funds into aquaculture in other states, after researching the current regulatory climate in Massachusetts. In the last three years, several million dollars of investment funds targeted for aquaculture have left Massachusetts for Canada, Chile, South Carolina, and Florida. Models used in other countries to attract and maintain business should be evaluated for use here as well. Note also that much of the development work has already been done elsewhere. This is one reason why Massachusetts is 10-15 years behind most of the progressive states in aquaculture development.

Interagency Involvement

Aquaculture permitting in itself is complex, and requires streamlining. This is commonly recognized, and is one of the items currently being evaluated by the agencies. However, streamlining alone will not solve all of industry's problems. Historically, each application has sparked a variety of different concerns or issues, ranging from right whale protection to the impacts on adjacent wetlands vegetation. There needs to be a coordinated mechanism to address new questions as they arise.

This is a key item that cannot be overemphasized. Without an industry government partnership with mutual goals of enhancing the aquaculture industry as a desirable and environmentally compatible activity, progress will continue to be slow, jobs will continue to leave our state. Much can be done by state agencies that are genuinely committed to aquaculture development.

A working model for interagency/industry problem solving is needed.

The recent Oyster Roundtable (ORT) process in Maryland involved all participants on a cooperative level. Such a model for conflict resolution is clearly needed, in which the state actually works with the private sector, with common goals. 40 people signed an initial agreement, including legislators, agency staff, environmentalists, watermen, and aquaculturists. The agreement encompassed three criteria:

1. That committee action would improve the ecological situation.
2. That committee decisions would improve the economic situation, and
3. The agencies were going to help rather than hinder the process.

> *"Aquaculture development must not be unduly constrained or burdened by government policy or the regulatory framework. At the same time, however, aquaculture development must be consistent with government responsibilities in such areas as habitat and biodiversit. Domestic and international experiences indicate that govenment support efforts should be focused on creating a positive framework to enable long-term, sustainable industry development."* Canada Federal Aquaculture Development Strategy, 1995.

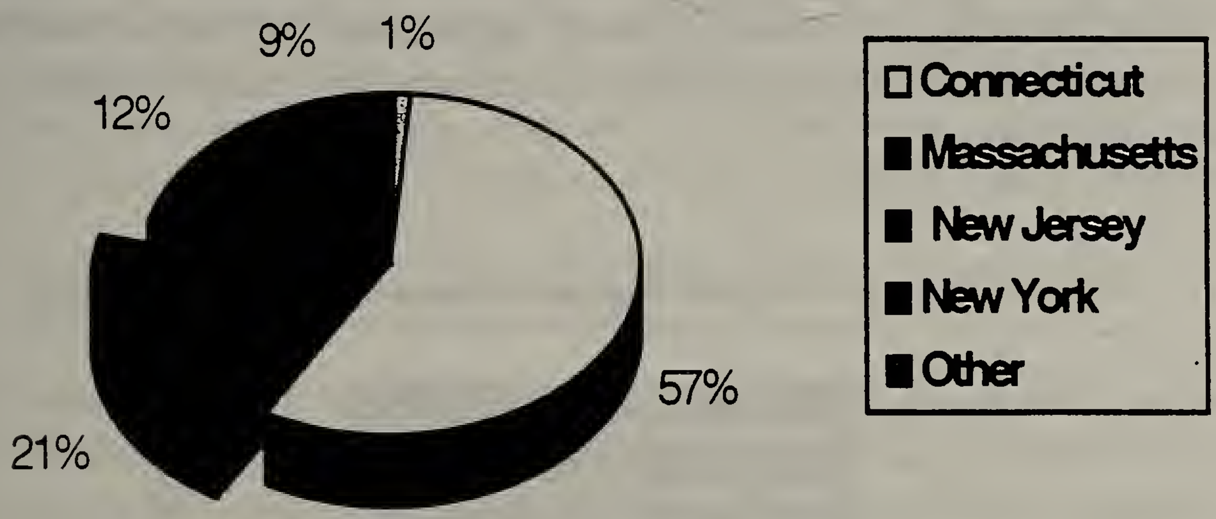
Both the private sector and public were equally represented, with each group having the opportunity to specify what their problems are, and the format to work out the situation with some resolution. Unfortunately, this process does not work if some of the participants have different agendas. State agencies need to be proactive in this area, sharing the common objectives of creating ways to promote aquaculture without compromising on environmental or natural resource considerations.

In Massachusetts, the agency infrastructure is highly developed, and turf oriented, as is the case in most states. In many other states, as well as Canada, some type of committee structure for problem solving in aquaculture has been established, to address ongoing conflicts.

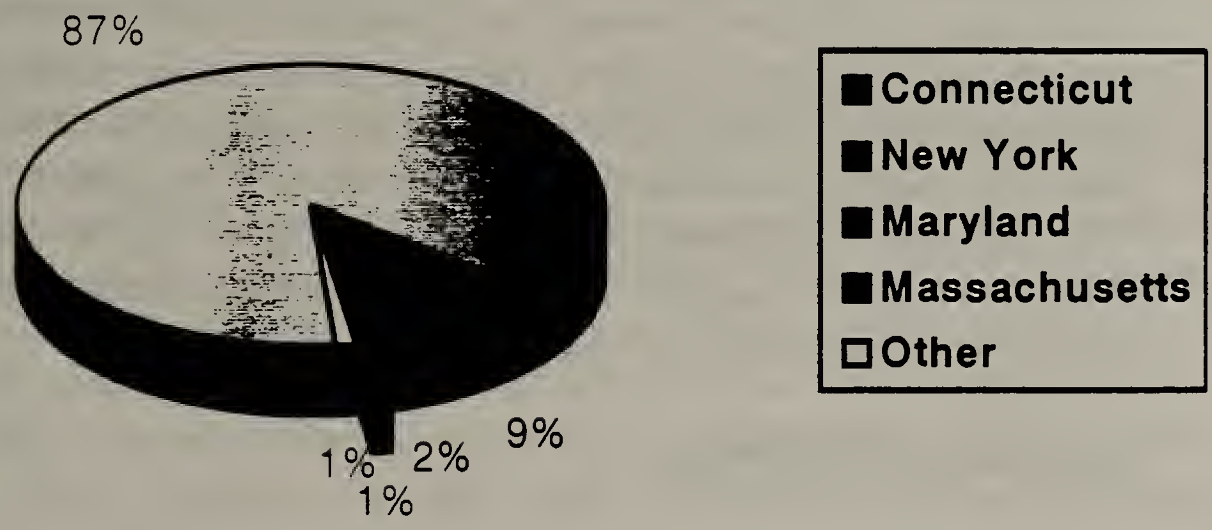
Recommendation: Develop an Industry driven Aquaculture Commission to serve the following functions:

- provide policy framework for development of aquaculture within the state
- advise legislature and informally assists agencies by interpreting policy issues, identifying potential areas of conflict, and by providing leadership in conflict resolution
- direct responsibilities for drafting and reviewing proposed legislation affecting the aquaculture industry, as well as the industry's impact on the natural resources of the state
- the committee would have no direct regulatory authority, but is available for consultation regarding broad policy issues. Aquaculturists may contact the committee directly for assistance
- serve in a mediating role, providing conflict resolution in the event of chronic maladaptation to the regulatory structure
- as each aquaculture situation is slightly different, there needs to be a workable method for conflict resolution and progress, which does not currently exist. The establishment of an Aquaculture Coordinator is the first step in this direction, but a working committee that is able to hold some type of productive dialogue, leading to workable solutions that can be approved by both industry and regulatory groups is even more desirable
- define what environmental issues are actually of concern, and which are not. This would solve many future problems, not only between the agencies, but also for new applicants
- with the assistance of the Aquaculture Coordinator, provide a generic environmental impact report for problematical issues, documenting solutions to common questions that inevitably arise with every permit application

1992 Regional Farmed Quahog Production
216,000 Bushels (est.)



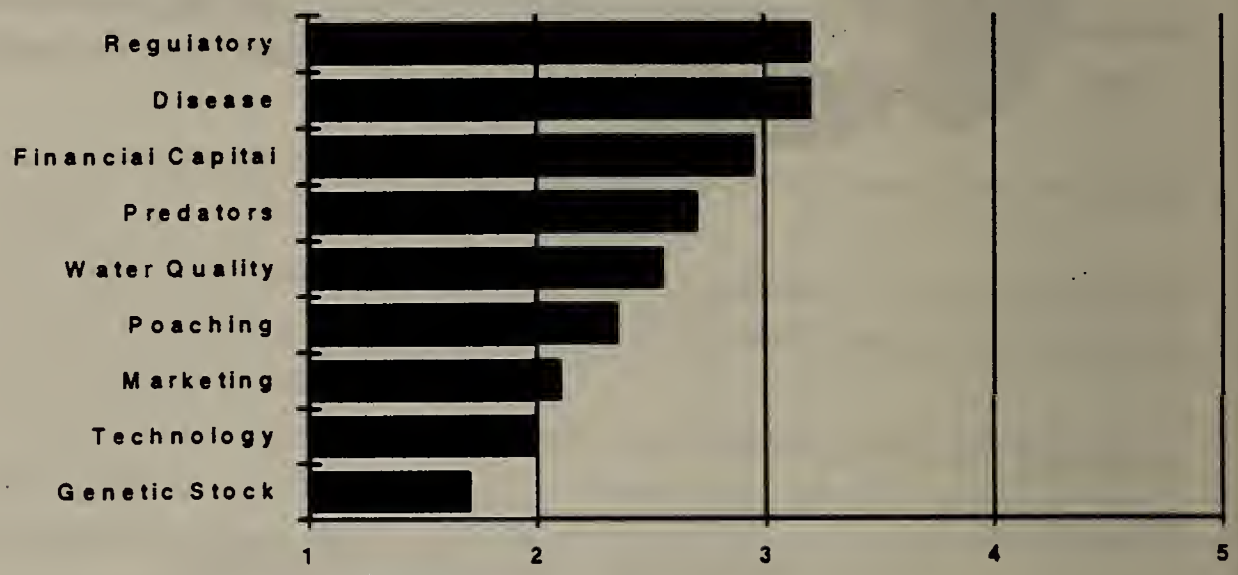
1992 Northeast Cultured Oyster Production
1,020,000 Bushels (est.)



SHELLFISH CULTURE IN MARINE WATERS

Massachusetts has immediate potential for tremendous growth in shellfish aquaculture. There are obstacles however, which if addressed will save existing jobs and create new job opportunities immediately. Culture technologies are well developed, the market is strong, and thousands of acres of exceptional grounds exist throughout southeastern Massachusetts. Industry constraints are noted below:

Oyster Industry Constraints



1 = Not Constraining 2 = Slightly Constraining 3 = Moderately Constraining 4 = Very Constraining
5 = Totally Prohibitive

The issues below are pressing and of immediate concern to existing growers. These issues should be kept separate from potential concerns that do not yet exist. For example, although there is potential for aquaculture production of marine finfish or sea scallops, there are no existing operations here at this time. Issues relative to future concerns should be identified and addressed as such. The Aquaculture Commission working in tangent with an Aquaculture Coordinator and regulatory agencies will provide an effective mechanism to do so, accepting a longer time line for resolution.

> *"Shellfish grants remain under town control and are difficult or impossible to acquire. Each town has free reign and their own criteria. There is little uniformity in the process if issuing (or closing) grants. To have no guarantee of renewal, or to have to battle political pressures (local) does not provide great incentive to invest capital in Aquaculture. There should be absolute right of renewal provided that the laws - which should be uniform - are adhered to.*
> Richard Nelson, Cotuit Oyster Company

Immediate Concerns:

Guaranteed right of renewal on shellfish licenses.

Reasons for forfeiture of an aquaculture license are clearly spelled out: inactivity or illegal activity. Barring these circumstances, operators need a guaranteed right of renewal in order to expand and attract private investment in the long term. Existing operators should be grandfathered to continue the activity as long as all relevant laws are adhered to.

Recommendation: An amendment to Ch. 130, sec. 57, specifying the guaranteed right of renewal once the grant has been properly licensed, e.g. "the license will be renewed unless..." If there is some type of problem with the grant, then this should be brought up in the initial (and extensive) review process. The grant should not be given out in the first place. This would prevent the arbitrary and retroactive revocation of a business license, which could now occur at any time. In addition, in the event that a license is actually terminated by a town, an appeal process should exist via the Division of Marine Fisheries.

"Aquaculture is a business, and needs to be treated as one. Some of the existing laws don't take this into account." Richard Kraus, Aquaculture Resource Corp, Dennis

Aquaculture licenses should be salable, transferable, and heritable.

A business, once successfully established, is valuable. A lease should be usable as collateral. In aquaculture, individuals can invest 20 years in developing the business, but then have nothing to show for it if they want to retire. As is, they simply must revert the area back to the town with no compensation. Although Ch.130, sec.57 allows for the transfer, it is now at the approval of the City Council or Board of Selectmen. Some towns are working on regulations prohibiting the transfer. This is probably the single most important factor slowing the growth of the shellfish industry today. If a business can be purchased, developed, and later sold at a profit, investors would be more likely to become involved.

Recommendation: Ch. 130 sec.57 should be amended to allow for sale, transfer, or heritability at the discretion of the license holder.

Tidelands Rights Issues.

A major problem for shellfish aquaculture is individual private tidelands rights, which is currently being debated. At the same time, the court decision granting private tidelands rights also presents opportunities for landowners interested in aquaculture. A private landowner who claims to own the flats and would like to do aquaculture, on private flats, can still be restricted by local regulations. We strongly suggest language that specifies all lands below mean low water (MLW) as state property. As no taxes have been paid on these supposedly ''private'' tidelands, the actual value should be low or nonexistent, as no assessments have yet been made. Short of taking existing grants by eminent domain, as state property, some type of protection needs to be afforded to the grower.

In addition, the ruling Pazolt vs. LaForte needs to considered for its positive as well as deleterious aspects. The court decision clearly specifies that fishing is protected under Colonial Ordinance, including access across private lands to and from the fishing (harvesting) area . At the same time, the ruling stated that aquaculture was farming and not fishing. In cases where private property owners wish to conduct an agricultural activity on their own private tidelands, this ruling provides an opportunity for aquaculture that did not exist prior to this decision. (Pazolt vs. LaForte, 1993, Supreme Judicial Court, MA)

Recommendation: Private tidelands need to be assessed, and taxed, thereby clarifying ownership as well as property bounds.

a. Waterfront property owners desiring control over tidal flats adjacent to their uplands determine the extent of their own property boundaries, at their own expense, using a Registered Land Surveyor. The property will then be assessable and taxable.
b. Privately surveyed tidelands should be assessed and taxed by the towns. These areas, if privately held, should provide some type of tax base for the communities involved.
c. Failure to survey these lands will result in a tax taking by the towns. Ownership of said flats cannot be proven until properly surveyed.

This approach allows the landowner to determine boundaries if interested, does not violate private property rights in any way, provides additional tax base for the community, and allows disinterested landowners the option of no taxation.

The State needs to make a genuine commitment to this industry if it is to grow. Local control issues for the most part have prevented a larger scale expansion, and will continue to do so until jurisdiction has been established. The State needs to assert its jurisdiction over lands below mean low water.

Recommendation for Legislation: Private ownership of intertidal flats ends at the mean low water mark, or 1600 feet from mean high water, whichever is less. This would entail amending the Colonial Ordinance to read "mean low water" instead of "farthest point of the tide".

Environmental impacts of shellfish culture need to be understood by regulatory agencies.

A number of biological and ecological analyses can be applied to shellfish culture practices to determine impacts on the ecosystem. Once understood, it can be seen that the activity is beneficial if examined using traditional biological and ecological indices. Shellfish culture creates new habitat in previously unproductive, barren areas. Species diversity is increased, as the activity provides food as well as shelter for numerous species that could not exist in such locations otherwise. Further, if the activity is stopped, the area reverts to its previous state. The activity is analogous to the construction of artificial reefs, an activity that has been promoted by a number of countries as beneficial for fisheries. This needs to be recognized by regulators.

In addition, if there are environmental concerns, it should be the responsibility of the regulatory agency to spell out, specifically, in writing, what the concerns are and the scientific basis for those concerns. Credentialed staff should be responsible for evaluation and decision making. It is ludicrous for the applicant to ''prove'' that there are no impacts, when the concerns cannot be specified by the agency involved.

Environmental concerns are brought forward with each new aquaculture application. These are generally combined with a lack of documentation or science.

"The same concerns that were addressed ten or fifteen years ago are still being discussed today, at each new application hearing."

Environmental concerns need to be addressed in a manner acceptable to all involved. Future applicants should not be required to spend additional funds to prove that there is no problem. For example, there are no known environmental detriments related to shellfish culture practices, although it can be clearly documented that there are environmental benefits. The DEP Farmlands Advisory Committee process should be resumed with this in mind.

Recommendation: **Create a generic environmental impact review for each of the situations in question.** This would not only provide necessary data for the first application, but also would be usable for the future applicants, who would otherwise be forced to undergo the same frustrations in answering the same questions, posed by anti-aquaculture ''public interest'' groups.

Division of Marine Fisheries

Recommendation: **Regulatory authority for shellfish aquaculture must remain within the Division of Marine Fisheries, Ch. 130 sec. 57.**

This is a key item, as existing Marine Fisheries Laws already include statute specifically developed for shellfish culture. DMF is already responsible for the commercial shellfisheries. Most of the national and international laws governing the transport and sale of shellfish are identical for aquacultured product.

"My application for a shellfish aquaculture license was filed in November and it was approved by the town. By May of the following year, the state had still not been able to survey the area." shellfish grower, Barnstable County

Recommendation: **Fund 1 FTE position Aquaculture staff, responsible for permitting, site surveys, and technical assistance.** As the industry grows, agency requirements will also increase accordingly. Present staffing level within the DMF is inadequate to meet even the existing needs. A full time staff position whose sole function is aquacultural assistance would not only benefit the industry, but will also be necessary for the agency to properly handle the increasing number of aquaculture requests.

Recommendation: **Appropriate conditionally closed areas should be evaluated and made available for the one year nursery culture of shellfish seed, providing that the seed is moved out to clean waters for the final years of growout before market.** This would provide numerous nursery and over-wintering sites currently not available, with no public health hazards associated with growing seed in these areas.

Regulations targeted at natural resource stocks conflicting with aquaculture is a common problem across the country. In a situation where growers purchase the seed from hatcheries, and the seed is technically their property, they should be able to manage the crop as needed. The intent of regulations preventing the sale or possession of seed is to protect natural stocks, and has no bearing on aquaculture other than to criminalize otherwise normal and customary practices.

"There is a vast resource of shellfish in contaminated water going to waste. Proper management of these areas could provide much needed seed as well as grow out areas for juvenile shellfish." Richard Nelson, Cotuit Oyster

Recommendation: **An "aquaculture permit" is requested for growers that purchase hatchery seed.** This would allow the possession and transport of said seed by the grower. Current permitting only allows the transport of seed from the hatchery directly to the growing area. The shellfish cannot legally leave the growing area at this time (even for culling purposes) until legal size.

LOCAL CONTROL ISSUES

Although all aspects of shellfish management, including shellfish aquaculture, is legislated as a local decision under Ch. 130, the state does have authority to exercise control if the town does not do so. For the most part, the industry has no interest in changing local control to state management. The state already has this option in towns where no local control is exercised, but in towns where local control exists, this is generally seen as preferable.

At the same time, local Selectmen have the sole discretion to arbitrarily deny any and all aquaculture applications. Towns can restrict or actually prohibit aquaculture entirely. This is a major impediment to industry expansion at this time, even though thousands of acres of suitable grounds exist.

Fees for acreage.

There should continue to be a fee per acre which is paid to the town for the privilege of using the area for aquaculture. Existing law specifies ''not more than $25/acre/year, at the discretion of the town". Although some towns are interested in raising this fee, the benefits to the community from productive renewable resource based industry is clearly far greater than the per acre grant fees collected. The customarily used multiplier effect on this type of industry is close to five times the landed value generated. The maximum return to the community results when these businesses are profitable and self-sustaining.

Recommendation: **No changes in the existing fee structure.**

Requiring use of area.

A minimum amount of product per acre sold per year should be established. The existing wording in C. 130 requires $250/acre product, which is outdated and currently not significant.

Recommendation: **A product sales value of a minimum of $2000/acre/ year is suggested as a necessary stipulation in the license, starting at the fourth year after receiving the license.** If this level of activity is not maintained, barring natural disasters or other circumstances, the area reverts back to the town. This forces the grower to not only invest, but also to utilize the space given. As prime aquaculture space is limiting, it is imperative that usable grounds be available to individuals that will produce results.

Municipal propagation funds.

Aquaculture techniques can also be used effectively at the municipal level, for the benefit of the entire community.

Recommendation: **Reimbursement funding to the municipalities specifically for shellfish enhancement and propagation, should be reinstated.** These funds would be used to enhance the public shellfisheries, using proven methods, hatchery technology, and other advances that are now normally used by the private sector.

For each hour spent working an aquaculture farm, there is one less hour the individual can spend in the wild fishery. The impact of aquaculture is significant in that pressures on the wild fisheries are reduced, even though the individuals still hold licenses and may continue to work the fishery to supplement income rather than as the sole source of income. The presence of aquaculture also stabilizes the local economy, as the wild fishery tends to have major fluctuations.

Aquaculture grants need to be a sufficient size to allow for economy of scale in operations.

This is also a local control decision. Decision making bodies in coastal communities need to know that 1/2 acre shellfish grants are not large enough to provide a full time stable income. At least 2-3 acres is recommended if the business is to become large enough to provide employment to individuals other than the lease holders. However this area should be approved with previously determined room for expansion up to 5 acres, if not 10 acres, providing the operator follows the regulations in effect.

Food and Drug Administration Massachusetts Department of Public Health (MDPH).

The FDA has recently developed much stricter protocol for seafood products, especially for processing facilities. It must be noted that ''processing'' differs significantly from ''transporting livestock'', as processing refers to the cutting, or otherwise preparing, of the product. The fish can be sold live, and these are ''live'' as opposed to ''processed". The processing regulations come into effect only if the fish is cut, beheaded, eviscerated, filleted, or otherwise ''processed''.

Trout growers that stock fish ponds with live fish are not ''processing'' fish, they are selling live fish. Similarly, shellfish harvesters, shellfish aquaculturists and shellfish dealers are not ''processors'' unless they shuck or otherwise prepare opened product for resale.

Other Shellfish Species.

Although sea scallops (Placopecten magellanicus) are a potential crop with a strong market demand, there are no examples of major commercial success with this species in the Northern Hemisphere. Difficulties with hatchery production exist, and there are no reliable seed sources at this time. Although sea scallops have been spawned for the Truro Aquaculture Project, and are under cultivation in a Massachusetts hatchery, natural supplies of seed would be needed for the industry to develop at this time. Extensive culture methods requiring a minimum of labor, such as the widespread bottom planting of seed in suitable areas, have provided the most favorable results to date (Bastien, et al, 1993). The cost of constructing and maintaining protective gear for several years is an impediment at this time. Successful examples do exist with other scallop species, in Japan, Chile, and Peru, but these are faster growing species cultivated in areas with relatively inexpensive labor.

The Sea Scallop Working Group has been meeting to address the permitting and logistics needs for the large scale culture of this species. The one scallop culture application currently in progress is being held up by federal agencies with conflicting mandates, one of which is the Endangered Species Act. A variety of issues that do not affect the other forms of aquaculture in the state need to be addressed, including federal permitting in offshore waters.

Recommendation: **Incorporate the recommendations from the Sea Scallop Working Group, which is currently meeting, into the Strategic Plan upon completion.**

MARINE NET PEN CULTURE OF FINFISH

As yet there are no existing marine net pen operations in Massachusetts. Several applications have been received and discouraged, however. Although there is potential in this area, there are only two applications pending. The State of Maine has a procedure in place, as well as ongoing monitoring protocol for marine net pen operations. (Maine Department of Marine Resources, 1988). These were developed in 1988 in conjunction with the US Army Corps, and is the fastest way for industry entry, given the most relevant and closest neighboring policy.

At the same time, there have been significant advances internationally in terms of long term evaluation of site impacts, environmental monitoring, and site recovery. This information, such as monitoring protocols from Canada, Norway and Scotland can be used to improve upon the present Maine procedure. There is no urgency to this, however, as Massachusetts does not yet have an industry to monitor.

It is imperative that environmental monitoring be undertaken with a broad ecological perspective, taking into account the sizable data base that already exists. The monitoring program cannot evolve into a research project, but should focus on variables known to be influenced by marine fish culture operations.

At the federal level, the Joint Subcommittee on Aquaculture (JSA) is also currently involved in developing a uniform regulatory process for offshore marine aquaculture operations. In terms of the permitting process, Maine already has an ongoing system, approved federally. The process works, and should be utilized immediately as a template for adoption here. As long as there is flexibility to improve on the process, especially in terms of environmental monitoring protocol, the Maine model is more than adequate at the present time.

Recommendation: **The Maine marine net pen protocol be utilized as a model for marine finfish permitting in Massachusetts.**

Environmental Monitoring.

Maine has a $.01/lb. tax on aquacultured fish, which is used specifically for environmental monitoring (impacts of marine finfish culture operations). However, this level of taxation does not supply any revenue unless there is a sizable industry to tax. This is not currently the situation in Massachusetts, where there are zero (0) marine net pen operations at this time.

Although net pens are generally located in areas with strong current flows, it is clear that the activity can cause a localized impact on the benthos. It has also been found that species diversity may increase at the periphery of the nutrient loaded area, and that sites recover completely to their original form within 18 months if pens are relocated. Clearly, this level of environmental impact is not only reversible, but the full scope of impact needs to be evaluated with a broader ecological perspective.

International efforts at initial siting, as well as ongoing monitoring should be studied and utilized as appropriate. Note that most European countries are somewhat more advanced in this area than the US, and that these considerations have for the most part already been addressed.

The Norwegian approach to environmental impact assessment was described at the 1994 meeting of the ICES Working Group on "Environmental Interaction of Mariculture". This system includes modelling of site characteristics in addition to monitoring specific parameters, and will be tried out in Norway in 1995. It will be documented and published in the literature after scientific review. Although the levels of exploitation and associated monitoring frequencies have not yet been set, there is no need to reinvent this process here.

Given the limited current status of fish farming in Massachusetts, combined with the quite advanced status of monitoring science, it does not seem necessary to dwell upon monitoring concerns at this time. New advances in monitoring or siting can readily be adopted as needed.

Recommendation: **Existing environmental monitoring protocols being evaluated in Norway should be adopted as appropriate.**

" Interaction between aquaculture operations and the environment is complex. The viability of aquaculture operations is directly dependent on the maintenance of a healthy and productive aquatic environment. Coastal pollution is harmful to aquaculture development. If improperly managed, however, aquaculture operations can themselves be detrimental to the environment. Consequently, sustainable aquaculture development demands that aquaculturists operate within stringent environmental standards. Care must be taken to ensure the integrity of all aspects of the aquatic environment, including seafloor and substrates, biodiversity, habitat and disease transfer. Aquaculturists and environmentalists are natural allies in their work to protect the aquatic environment." Canada Federal Aquaculture Strategic Plan, 1995.

FRESHWATER AQUACULTURE

> *"Aquacultural conversion to ponds changes the nature of farm land, but less significantly than the original clearing of fields. It is a change in ecosystem but one that causes much less change than what is already done on many existing fields. Change is not inherently bad; it is the kind of change that counts."*
> *John Reid, Bioshelters, Amherst, MA*

The fresh water aquaculture activities in Massachusetts are primarily devoted to trout, tilapia, and hybrid striped bass. The current combined value of these products is approximately $4 million dollars. The US is a net importer of finfish, much of which could be produced domestically. In order to expand on a significant national level, the industry needs a fresh fish product that is competitive in price with other forms of protein, such as chicken, not only other fish. Massachusetts finfish growers continue to pursue this goal, however research and development funds are rarely available.

Trout have been grown in Massachusetts for over a century in open raceway systems utilizing ground water wells and cold water springs and streams. Hundreds of thousands of pounds of trout are produced annually by both the state and the private sector. In the past ten years tilapia and striped bass have been added to the aquaculture mix as a result of the development of state of the art recirculating systems. Currently there are four producers using recirculating technology and there are two more under construction

The potential for development of fresh water finfish aquaculture is very large and has the potential of producing significant jobs and income. The major areas which show potential for expansion are the propagation of fish in warm water ponds and the proliferation of recirculating systems.

Pond Culture

Most Massachusetts farms have ponds or pond sites which could be developed to contribute to the income of the farm and to overall aquacultural production of the state. Many ponds created in the last century have long since filed in and turned to marshes, swamps or wet meadows. Many of these have the potential, if reclaimed, to provide important aquaculture sites.

Production in ponds of cool water species such as bass, perch, carp, and catfish can yield over 4000 lb./acre under active management. With minimal management yields of 1000 lb./ acre are attainable with minimal risk. If there were an average of 3 acres per town under minimal cultivation, Massachusetts would produce over one million pounds of additional product for food or recreation.

Because of the inherent availability of ponds and pond sites to farmers and land owners it is easy to develop an extensive aquacultural facility with minimal cash outlay and with minimal environmental risks. The large number of private ponds available for fish production have incredible potential. By providing assistance to interested aquaculturists, this could have a major effect on the total fish production in the Commonwealth and create jobs on-site and in processing. These facilities can potentially provide significant quantities of fish for local consumption or recreational enjoyment.

At the same time, there are only about eight months a year when reasonable growth can be obtained in Massachusetts ponds because of seasonal variations in water temperatures. Production must be seasonal, which would be limiting and noncompetitive by southern standards.

Also because of the loss of wetlands over the years, Massachusetts has developed wetlands regulations which are very restrictive. If the development of pond aquaculture is to play a significant role in future aquaculture, adjustments must be made in the wetlands regulations and in their interpretation.

Economics of Sportfisheries and Tourism

Stocking and fee fishing programs are very attractive to tourists. The presence of otherwise unavailable sport fish, such as sea run brown trout, Atlantic salmon or rainbow trout are a primary attractions. These fish are aquaculturally produced and then stocked into natural waters. Salmon are stocked in Nickerson State Park (Brewster) and the Quabbin Reservoir (Petersham, Salem). These fish are often the sole incentive of sportfishermen visiting the area, attracting tourism dollars that would be lost without this type of stocking program. The economic impacts of sportfishing in Massachusetts are considerable, as this is now a $100 million per year industry, employing over 3000 FTE's. Note that this includes both marine and freshwater sportfishing.

Fee fishing at private facilities has demonstrated benefits, for similar reasons, but attracts a broader spectrum of sportsmen and tourists. For example, bus tours from major metropolitan areas travel to Massachusetts and fish as part of their travel package. Families with small children seek out this type of fishing, as the fishing is productive, accessible, and the sites often provide other types of recreation, such as hiking trails, picnic sites, camping. Fee fishing also boasts the greatest profit margin to the producer of any type of freshwater aquaculture production, allowing a direct retail sale without processing.

Fee fishing revenues could be significantly increased if some additional warm water species could be utilized during the summer when trout fishing is slow. These might include hybrid striped bass, tilapia, white perch, or any other species well suited to a pond environment.

Flow Through Systems

Flow through systems, like those in use at state hatchery facilities, utilize water from springs, wells, or streams. The water flows through raceways or tanks and is ultimately discharged to a local stream or river. These systems have a long history and are well understood as a method of propagation.

The benefits of these systems are their simplicity. There is also a wealth of information on how to grow fish in this type of system. With adequate water availability, large quantities of fish can be grown in a relatively small space. In situations where both water and discharge potentials exist, this type of facility can contribute significantly to fish production.

The disadvantage of this system is the large amount of water used per pound of fish produced. There is typically no conflict unless there is competing uses for the water. Future competition for water resources may make these types of systems less desirable. A second disadvantage is the large discharge volume which must be permitted under an NPDES permit. There are limited opportunities where both water availability and sites appropriate for discharge are coincident. Siting for this type of facility is critical.

RECIRCULATING SYSTEMS

Recirculating systems for fish production are a growing segment of the aquaculture industry in Massachusetts. At this time, two large facilities are under development. The potential for expansion using this technology exists, and is already underway in other states, particularly in Maryland and Delaware. Recirculating systems benefit from utilizing many levels of advanced technology, but the inherent complexity is also the cause for the slow development of new businesses. Massachusetts has a technological advantage over many states, and it is anticipated that recirculating systems will eventually outproduce extensive pond and raceway type culture systems.

> *"Aquaculture in closed systems has come of age. In the past it was a nice idea, but today it is an economic reality. It provides opportunities for aquaculture to locate in urban locations, and provide jobs where there are currently few options."* Dr. Robert Biagi, Executive Director, Neva Esperanza, Holyoke

A primary benefit of recirculating systems is that very high volumes of fish can be grown in a small area using only a fraction of the water needed for a flow through facility. For example, a one acre facility can reliably produce 500,000 lb./year, or more, depending on species. Site requirements are much less stringent than in ponds due to limited water use and resulting effluent. In terms of operation, closed systems provide a much greater degree of control over variables that characteristically cause serious losses, e.g. predation, disease, storm events, escape. Environmental conditions within the system, such as oxygen, can be managed even though they may be expensive to manipulate. This provides a much greater production level. Closed systems can also be sited very close to market centers, allowing the delivery of a very fresh, or live product.

However, closed systems are very complicated, requiring a working knowledge of many different sciences. There is not yet technical support from traditional sources, such as University research or Extension, commonly used by agricultural producers. There are only a few individuals in the country that have a working knowledge of closed systems that would allow them to troubleshoot or assist growers using different methods. Untrained growers will have difficulties until such technical support services are available. It is most likely that such support will initially be provided via the private sector. In the application of recirculation technology to the marine situation there are many unanswered questions regarding the disposal of the salty sludge which can not be land applied. Research is needed into methods of appropriate disposal of marine sludge.

Recommendation: **An apprenticeship or similar program should be required for all new closed system permits.** The applicant can either undertake the program, or prove a level of skill that sufficiently demonstrates that they are qualified and capable of operating such a system. In addition to specific training, an operating permit is also provided at the completion of the program. This recommendation is based upon the success of the Norwegian government in training and increasing aquaculture production.

By requiring a competency level pre-permitting, industry failures can be eliminated. Failures can take a number of forms, ranging from losing the business entirely, to merely losing capital by making unnecessary errors. The second form is generally not documentable, not visible, but may slow or completely stop the development of a viable business. In most cases, new operators are capital limited and cannot afford such mistakes.

Recommendation: **Appropriate funds for Research and Development facilities, focused specifically on closed system technology.**

Department of Environmental Protection: Wetlands Division

Under the general laws of Massachusetts Chapter 141 Section 40, a permit is required for activities in and around wetlands. The current interpretation of the regulations of this section is very restrictive to aquaculture.

This has been a chronic problem and needs to be addressed as part of the Strategic Plan. In summary, as aquaculture is done in the water, the activities are under the jurisdiction of the Wetlands Protection Act. Local Conservation Commissions have regulatory authority at the local level, which can extend out to three miles. In addition to state regulations, many towns also have their own

> *"Environmental standards should not be lowered with this process, but the ease of compliance can be raised. Ironically, converting agricultural land into aquacultural production, greatly reduces the pollution potential of that land and puts it into a much more strict and well-monitored regulatory environment. For this reason, all environmentalists should be encouraged to assist the development of more aquaculture, not resist."*
> John Reid, Bioshelters, 1995

wetlands bylaw. Conservation Commission members for the most part are not scientists, and have little basis for making informed decisions on the impacts of the activities in question. Local decisions, either pro or con, can also be appealed to the DEP. Opponents frequently use this strategy to prevent aquaculture permitting, as the Superceding Order from the DEP takes several months, and also can trigger a MEPA review. Regional DEP offices become involved to issue the Superceding Order, if an appeal is requested.

Although activities in and around wetlands are under the jurisdiction of this agency, the focus should not be the prohibition of all activity. Shifting the focus to prevent adverse impacts is more appropriate. Many wetlands are renewable and manageable resources. Interests of the Act can not only be protected, but can also be enhanced by appropriate planned management.

Recommendation: **DEP decisions should be consistent statewide, and be based upon scientific data.** If there are negative environmental aspects to certain activities they should be documented, and the activity regulated consistently.

Farmlands Advisory Committee (FAC) process.

The intent of the FAC process was to specify what is meant by ''normal maintenance and improvement'' regarding agricultural and aquacultural activities in and around wetlands. The purpose was to take the industry out of situations in which interpretations might be ambiguous. The FAC needs to focus on industry needs and environmental issues in addition to definition resolution.

In countries where aquaculture is successful, it is viewed as a public benefit to have environmentally compatible, export producing industry. In this context, natural resources are intentionally managed as renewable, sustainable resources, in a nondestructive manner.

The intent is not to allow the destruction of wetlands or wildlife habitat which has not been considered, but to allow development to be done where the fundamental interests of the acts and laws are not harmed. Instead of a no alteration standard, this would provide for the alteration with consideration for the wetland or wildlife habitat in the context of other similar resources in the local, regional, and state wide area.

Recommendation: **The FAC process for aquaculture should be resumed, following the legislative mandate that created the FAC.**

Recommendation: **A Generic Environmental Impact Report (GEIR) should be developed for certain activities such as pond construction and shellfish culture.** This would facilitate a ''general permit'' procedure for certain types of applications. This would allow DEP to spell out concerns without leaving the applicant unsure of the standards to be met.

Department of Environmental Protection, Office of Water Management Water Withdrawal Permit

Currently, DEP Water Supply issues withdrawal permits by watershed regions. Permits are issued for 20 years. The application fee for the permit is currently $1900. This fee for small aquaculture business can represent a hardship and there should be a mechanism for prorating the fee for small business. There is no current stated method for transfer of the permit, or change of use. DEP is currently reevaluating the way in which the permits are granted. They propose to review a withdrawal application only if the pump test results have been provided. This may require acquisition of a site or at least the development of a well prior to any commitment by DEP. For the small aquaculturist this presents a considerable hardship and risk.

Recommendation: **Preliminary approval of a withdrawal application subject to the pump test results so that there is some assurance that if the pump test does not present significant negative indications the permit will be granted.**

Recommendation: **Develop mechanism for sale or transfer of permit and rights to water.**

Recommendation: **Provide a mechanism for the change in water use under a permit without requiring a new application for a permit.**

Recommendation: **Create a sliding scale for the application fee to minimize hardship on small producers.**

Massachusetts Environmental Policy Act (MEPA)

The current MEPA program (MGL c.30,sec.61-62H) works well in general for the permitting need of the aquaculture industry. The difficulties which do occur are generally with other agencies and their expectations rather than with MEPA. Although MEPA requirements must be met before state permits can be issued, it is generally the state agency that denies the permit. Specific thresholds exist which trigger the MEPA process, including any appeal to DEP Wetlands requiring a Superseding Order of Conditions. This in turn can result in MEPA requiring the applicant to file an Environmental Impact Report (EIR). With the streamlining of the permit process and development of generic EIRs most problems which have arisen will not resurface.

Larger projects can also trigger the National Environmental Policy Act (NEPA) under sec. 42 U.S.C. 4321.

Surface Water Quality Discharge Program (antidegradation laws) (Massachusetts Clean Water Act, MGL c.21, sec.43).

DEP Water Pollution Control (MGL c.21, sec.43). One cannot reduce the water quality of receiving waters below that which it is characterized. This allows for different qualities of effluent, depending on the site. A very clean operation, for example, could be prevented if the receiving waters were low volume, relatively clean, and unaffected, even though the actual impact of the activity was negligible.

National Pollution Discharge Elimination System (NPDES) Federal Clean Water Act, sec. 402 (33 U.S.C. 1342).

Currently EPA and DEP Water Pollution Control issue a joint permit to regulate the discharge from fish facilities. This situation works fairly well unless the process gets derailed by the DEP. This frequently happens due to concerns that were not specified up front. The DWPC also issues the water quality certification under sec. 401 (Clean Water Act, 33 U.S.C.1344). The NPDES permit process is national, with routine federal procedures. A primary obstacle is that the permit cannot be granted until all appropriate state and local permits are obtained first. Individuals may blame the NPDES process, but the hold up is actually one of the components.

Application fees required by the state are currently in excess of $3000 for a new application and $1500 for a renewal. This is in addition to the engineering costs required for submission of the application. These fees are viewed as excessive considering the size of the business and the relative risks inherited by the applicant.

Recommendation: The Department of Environmental Protection, in conjunction with the Massachusetts Aquaculture Association, should develop a generic EIR for aquaculture facility siting that will describe the standards which, if met, will result in the granting of a permit.

Recommendation: **Standardize the effluent treatment practice of land applying the fish manure from such facilities to artificially created freshwater marshes.** This approach can provide total effluent control, and provide a ''zero discharge'' industry, in which no pollutants are discharged from the location. In order to do this, regulatory agencies need to understand the science of the technology. Many regulators do not understand the situation. For example, one grower was required to test for fecal coliform bacteria in the fish effluent. This reflects a basic lack of understanding by the regulatory agency.

Division of Fisheries and Wildlife

The Division of Fisheries and Wildlife is the primary regulatory agency for freshwater aquaculture with regard to species and the culture facilities design. Industry representatives feel that the aquaculture regulations recently promulgated by the Division need to be more reflective of the needs of the industry, especially in terms of economic implications. The current policies in effect regarding permitting, site inspection for new facilities, allowable species, liberation permits, and fish health are not conducive to industry development. At present there are very few species available to culture other than in recirculating systems in enclosed buildings. The Massachusetts Aquaculture Association has met with Department of Fisheries and Wildlife in an effort to increase the options for fish culture and species available.

The Massachusetts Aquaculture Association supports the Division of Fish & Wildlife as the regulatory agency for aquaculture. It is hoped that the industry and Fish and Wildlife will continue to develop a good working relationship which promotes the long term health of the industry. It would be helpful if the Division had a staff person specifically devoted to aquaculture issues. This would relieve other staff and also promote communication with the industry.

"The regulatory agencies generally make decisions with no consideration of the economic impacts on the industry." Tim Rice, Plymouth Rock Trout Company

Recommendation: **The Division of Fisheries and Wildlife should remain as the regulatory agency responsible for freshwater aquaculture, with a cooperative relationship with the Department of Agriculture.** The Department of Agriculture would serve the same functions as specified in the marine section.

Recommendation: **The Massachusetts Aquaculture Association, representing the aquaculture industry, should hold one position on the Fisheries Wildlife Advisory Board to improve communication and to represent the industry at times of regulatory change.**

Recommendation: **One FTE staff position should be funded specifically for aquaculture development, focusing on permits, site evaluation, fish health regulation, technical information.**

Recommendation: **Abandoned or vacant state fish production facilities should be utilized. Such facilities could be leased to the private sector, or engaged in public/private cooperative endeavors.** Many facilities are prime aquaculture sites, which cannot be duplicated elsewhere.

Recommendation: **The Division should review its policies regarding the stocking of alternative species in ponds to provide recreational fishing opportunities with the intent of making more species available.**

Stocking policies

The current liberation policy is not workable primarily because the Division itself cannot meet the requirements of being on site at each stocking, especially on weekends or early in the morning. The Division response to this is to schedule stockings during working hours on weekdays only. This creates unnecessary paperwork and restricts those businesses attempting to abide by policies even though they are not enforced.

Recommendation: **Any Class III propagator should be entitled to liberate fish listed on their permit in any public or private waters in the Commonwealth, for the year covered by the permit.**

Fish Health Management

Fish health is a serious concern to all producers. At this time, little to no assistance is available to producers, in an advisory/assistance capacity. The Division of Fisheries and Wildlife is responsible for monitoring fish health issues in Massachusetts. The primary concern of the department is the introduction of pathogens into Massachusetts waters which have not been here historically or which present a severe threat to the finfish populations of the state, primarily salmonids. There is an opportunity for the Division to take a more progressive role in promoting fish health management in all the culture facilities in the state.

New England Salmonid Health Guidelines

Current regulations require that all fish with the potential of carrying salmonid diseases have a fish health inspection before entry into the Commonwealth. This can severely restricts trade since many culture facilities are not certified disease free and therefore can not ship into this state. Additionally, producers can not ship to many of our neighbor states.

The current salmonid health guidelines are not based on scientific disease management and are in many respects untenable. The guidelines do not work as intended, but do significantly impede commerce. As a result, an alternative approach has been developed by industry, and has been endorsed by each aquaculture association in the Northeast Region (12 states) requesting major revisions and constructive improvements. (Appendix I, Fish Health).

> *"Decisions are often made by regulatory agencies with no thought of their economic implications to growers."*
> Tim Rice, Plymouth Rock Trout Co., Plymouth, MA

In many states the fish health program is based upon the poultry or other agricultural program. This has a veterinary or animal health approach, and is a successful model (Mamer, 1995). A similar program, based on fish health management, instead of pathogen eradication, should also be developed and employed here.

Recommendation: **Massachusetts should adopt the alternative proposed regulations developed by the United States Trout Farmers Association (USTFA) and endorsed by each of the 12 Aquaculture Associations in the Northeast Region (Appendix I)**. Massachusetts could then work with the other states in the Northeast to encourage their adoption of similar regulations and a reciprocity so that a standard policy can be developed to promote the industry region wide.

Recommendation: **Establish an Aquaculture Disease Committee, responsible for both marine and freshwater disease concerns.** There must be a focus on fish health management, rather than pathogen eradication, as all culture facilities sooner or later will have exposure to some form of fish pathogen.

The Aquaculture Disease Committee may recommend regulations designed to safeguard wild and cultured organisms. The Disease committee should include Division personnel, industry representatives, and member(s) with veterinary expertise. A working forum is critical for the discussion and resolution of these complex issues.

Recommendation: **The state should subsidize disease certification testing done by an accredited, impartial third party.** This specifically means to subsidize the actual testing, and not the testing facility. Such an approach would improve the monitoring opportunities of the private hatcheries and improve the overall quality of facility management and result in an improved bottom line for growers.

Recommendation: Fund an experienced fisheries veterinarian under the Department of Food and Agriculture or Cooperative Extension to assist producers with diagnosis, trouble shooting, and overall fish health management. This approach is successfully used in Canada, as this individual's function is to assist growers with fish health management, not to put them out of business. This is not a regulatory function, which is being handled by the Division.

New Species Introductions

Much has been written about the introduction of new and "exotic" species to new environments. Concern about such introductions is widespread, as there may be the potential for diseases, or other undesirable organisms arriving with the new introductions (Carlton, 1991). Concerns about the possible genetic dilution of native stocks also exist (Lester, 1991). In an extreme case, classifying the Atlantic salmon as an endangered species under the Endangered Species Act (ESA) could literally prohibit the culture of this species, as "farmed". Atlantic salmon are a different strain than the indigenous salmon, and the genetic integrity of the "endangered" gene pool may be compromised. Although the ESA is well justified, such an interpretation has frightening implications for producers. At the same time, aquaculture could be a vehicle to enhance potentially threatened stocks.

> *"As with all human endeavors, there is a risk associated with aquaculture. Disease, genetic dilution, escapes of exotic or introduced species, and eutrophication are often mentioned, but each of these potential risks can be minimized by best management practices."* Dennis Walsh, Walsh Consulting, Dennis, MA

Although there have been some undesirable consequences from new species introductions in the past, this must be balanced with the beneficial aspects. It should be noted that the rainbow trout and brown trout are both "introduced" species, and these are now cultivated extensively. Although neither is native to the area, both are not only cultured but also stocked into public waters. Although there are clear benefits to aquaculturists and researchers, prohibitive regulations that are arbitrary and not based on science are counterproductive. Clearly there are some species that are undesirable, but this does not apply to all organisms.

Recommendation: The confined culture of nonendemic aquaculture species be evaluated on a species specific basis, creating an "undesirable" species list rather than an "allowable" list.

FDA INAD Development (Investigational New Animal Drug)

Massachusetts aquaculture is subject to the limited availability of theraputatants as are all other states. Most therapeutic drugs are not registered at all, much less for specific fish. The only two registered antibiotics at this time are approved only for catfish and salmonids. The only way for a culturist to use a drug which is not yet certified is through the INAD process. Costs associated with INAD approval, when carried by industry, are prohibitively high and can take several years.

Recommendation: The Division of Fisheries and Wildlife should provide the necessary veterinary services to facilitate INAD approval. Fish & Wildlife should seek cooperation with Tufts Veterinary College and the Laboratory for Marine Animal Health at Woods Hole to assist in this process.

Feed supplies

Feed is the single greatest cost for all fish growers. A slightly cheaper, fresher feed, with lower transportation and distribution costs, would significantly improve business outlook for all fish growers. Feed could also be sold to neighboring states, as the closest other fish food source is Pennsylvania. With the state facilities also included in purchasing from a viable local supply, it is estimated that Massachusetts would use 1500 tons /year. The feed production facility would also create jobs, and provide an export product for the remainder of New England. In addition, currently unused product such as sea clam bellies and fish frames could be utilized in this process.

Recommendation: support the creation of a Massachusetts based aquaculture feed production facility, similar to the United Cooperative Farmers (UCF) facility in Gardner.

> *"We need to find ways to off set our cost disadvantage as a result of not being where the major feed producers are. Encouraging local feed production for the aquaculture industry would have a significant benefit in lowering cost of production."* Richard Rogers, Associate Professor, Dept. of Resource Economics, University of Massachusetts, Amherst

FINANCING

The financing community is by its very nature conservative when it views industries with perceived high risks. In Massachusetts, this is particularly true of the aquaculture industry. Businesses with proven track records, solid credit and strong managerial skills are still having difficulty securing traditional bank loans. Young businesses find it impossible.

Typically, banks make loans to businesses they understand and have seen flourish. Aquaculture ventures are complex and require unusual terms. The unique nature of the aquaculture industry with the assets of the business invested underwater, presents discomfort to land-oriented lenders. Weather and disease also produce hazards against which normal lending standards are inadequate. Historically, profit margins are thin and unstable. To the financial community, the risk of funding aquaculture is even greater than funding agriculture.

As a result, traditional avenues of securing loans remain lost to this industry. Other methods of financing, including government grants and loans, venture capital and equity capital have met with some success.

For the industry to flourish, it is incumbent upon aquaculture supporters to take the following steps to open traditional financing opportunities:

- Establish successful lending track records to be used by the financial community as models.
- Establish precedents for the industry in accounting practices which effect the viability of aquaculture loans
  a) Inventory typically is not carried on balance sheets. A formula needs to be determined to value inventory at differing stages of growth.
  b) Frequently the value of leased land is not carried. For example, shellfish grants are not typically carried as an asset.
- Leases need to be negotiated for longer time periods.
- Make initial loans appealing to the financial community by lowering or eliminating risk. Provide federal guarantees on loans, leaving banks with a 90% guaranteed loan and a first position. For larger loans, continue to patchwork funds. Utilize gap financing through state and federal programs willing to take a second or third position.
- Loans should be funded through the growth period and repaid with the regular stream of income after the growth period.

> *"While capital is always necessary it is mostly needed as equity capital and not debt financing. In the short run it would be helpful if this was made available other than through private markets. There are many state agencies that can assist with debt financing, but for the current state of the industry's development, debt lending is not appropriate. Over the long run, if the industry cannot sustain itself in private capital markets, it is probably because the industry is not viable, and should not be supported artificially with long-term state based equity investment. The one exception to this is for land and open space aquisition."*
> John Reid, Bioshelters, 1995

The Commonwealth of Massachusetts could greatly enhance the availability of investment funds by encouraging a more predictable, less volatile industry. This can be accomplished by:

- Establish resources within the Commonwealth to gather information pertaining to the aquaculture industry.
- Reduce delays caused by the permitting process
- Fund market research and development
- Provide increased information about aquaculture to traditional financial markets
- Hire a State Aquaculture Coordinator to work with the industry, provide information, encourage venture capital dollars to stay in state, and work with the financial community to encourage the financing of aquaculture projects.

> *"A primary impediment to aquaculture today is financing. There is a misconception about the nature of the business and very little information usable for investment analysis."* Tom Hopkins, President, Maryland Aquaculture Association

Sources of Debt and Equity Capital

The demand for credit is growing and the risk factor is being slowly negated by advances in technology and established, successful aquaculture operations. Similar to agriculture, smaller loans for aquaculture are potentially available with federal guarantees or through public and private initiatives. To date, the use of venture or equity capital for aquaculture development is the most likely source of funds.

Models from other states encouraging the aquaculture industry:

There is a direct correlation between states with growing aquaculture industries and direct state-funded support. Hawaii and California, with rapidly growing industries, have established loans or other financial assistance programs for aquaculture producers.

In 1993, the five leading aquaculture-producing states were Mississippi (channel catfish), Idaho (rainbow trout), Arkansas (Beatific), Louisiana (crayfish) and Washington (oysters). Each of these states provided financial assistance to the industry. Many states utilize CDBG funds for aquaculture, promoting job creation.

In Maryland an Aquaculture Loan fund of $500,000 exists. The regular required match for such funding is 50/50, however, if the loan is for bricks and mortar, with no operating expenses, it provides 80/20 state/private match.

Recommendation: **New initiative funding for aquaculture development should be appropriated for the purpose of providing economic assistance to aquaculture businesses.**

Commercial Banks

Loans for capital improvements and operating expenses can be obtained, but require guarantees assuring repayment of a certain percentage of the loan. In most cases personal collateral or cosigners are needed to guarantee loans (FmHA and SBA will provide guarantees up to 90%: information in appendix III).

Private Support

Major corporations have invested significant funds in aquaculture ventures, particularly in the southern states. Federal tax incentives were a major catalyst in encouraging corporations such as Purina and Weyerhauser to invest. Their investments have been highly successful and should be used as a model for other corporate investment.

Grants

Limited grant monies are available through the federal and state government and private foundations to fund innovative projects which may have a beneficial effect on the industry or our residents. In Massachusetts, grant funds have been used primarily for job creation and research and development. Grant dollars are also available as small business loans, frequently focusing on individuals who have been rejected by banks and more traditional funding sources. The Seed Corporation in Taunton offers such loans funded partially with HUD monies through the Executive Office of Communities and Development (EOCD). In addition to funding this strategic plan, EOCD has funded two aquaculture projects, in Nantucket and in Eastham, and has provided loan funds to a private facility in western Massachusetts.

Grant funds have been available annually through such programs as Saltonstall-Kennedy, FIG, NOAA, the EPA and NRAC. These funds are becoming increasingly competitive, however.

Venture Capital Information

Resources exist in Massachusetts for the purpose of identifying projects deemed viable for venture capital. These programs provide invaluable opportunities to showcase projects, receive technical assistance and potentially match venture capital with new initiatives. The Pioneer Valley Venture Forum and the MIT Venture Forum are examples of two such programs.

Recommendation: The Commonwealth of Massachusetts should assist in the establishment of a revolving loan fund for aquaculture start-up capital.

Recommendation: The Department of Food and Agriculture should maintain a database to collect and distribute information pertaining to the aquaculture industry for the purpose of attracting new financing.

Recommendation: The Executive Office of Economic Affairs should continue to fund Small Business Assistance Programs to encourage industry growth. Currently the Massachusetts Aquaculture Association in conjunction with the Cape Cod Resource is offering technical assistance, referrals and small group trainings to interested parties. Over three hundred requests for assistance have been receive this year. This program will have a significant impact on job creation and new business development in the aquaculture industry. Expansion of this program should include the provision of information to potential borrowers and lenders. Venture capitalists, state suported funding programs and other financial institutions should be provided with information about the industry with documentation of industry successes. Borrowers should receive regular bulletins clearly explaining all the options for funding new ventures. This expansion should include the provision of assistance to aquaculture businesses seeking to develop business plans and financing.

> *"We can not emphasize enough the importance of assuring proper and adequate financing for aquaculture ventures...the Department of Agriculture should create a revolving loan fund to provide start-up capital to private aquaculture ventures..."* Chris Percy and Dr. G. C. Matthiessen, 1984, The Sounds Conservancy, Connecticut

"Research must be industry driven to ensure direct applicability." Northeast Regional Aquaculture Center, Industry Summit, 1992.

Research and Development Incentives

Research and Development (R&D) should be done in close cooperation with the industry to assure that the research effort is productively focused. A grant program utilizing a Request for Proposals (RFP) open to researchers of all types has not proven effective. RFP's should require an industry match, as well as participation. Several approaches could be considered.

- Direct R&D grants
- Direct operating grants, matching the industry R&D costs. These should be made available to credentialed industry staff, in conjunction with industry conducted R&D efforts
- Tax incentives for R&D costs
- Long term line item budget for the Massachusetts Aquaculture Innovation Center, set up specifically as R&D effort, controlled by industry review.

Recommendation: **Create or expand upon business development grants, such as SBIR, which do not require public disclosure of results.** This will allow whatever techniques that are developed to remain proprietary to the company and the state. This will prevent the flight of technology from the region that supported its development.

Recommendation: **Establish stable long term funding for the Massachusetts Aquaculture Innovation Center, modeled after the Maine Aquaculture Innovation Center**. The MAIC is state assisted, but industry driven research and development center. Maine established three such centers in 1989 to expand cooperative efforts between industry and the research community. This approach has proven itself to be very responsive to industry needs while maintaining a balanced representation from government and industry.

TRAINING AND EDUCATION

In order for aquaculture to flourish as an industry, there needs to be an educational component for research and development, training, and operations. This can be done with private funds, or with the assistance of government. Note the success of most other nations with well-developed aquaculture industries (e.g. Norway, Chile, Japan). These countries invest heavily in R&D as well as training, to ensure the success of operators, and an eventual export product. Aquaculture research and Extension funding is not only valuable but necessary in maintaining some type of competitive standing nationally and worldwide. However, industry input in focusing these funds is paramount. Research directives cannot be developed by researchers based in an academic environment. An industry-research partnership, such as that created by the Massachusetts Aquaculture Innovation Center, would provide the most useful returns.

Education and training are sorely needed by prospective growers and regulators. Many business failures in the past can be attributed to inadequately prepared operators. Any business failure in aquaculture creates financial problems for the remainder of the industry. Successful start-ups are a key component to long term success. Several successful models exist worldwide which could also be useful here.

Information Transfer, Extension and Education

Information transfer is critical to the growth of the industry. Currently, the Cape Cod Resource, the Massachusetts Aquaculture Innovation Center and the Massachusetts Aquaculture Association work in tangent to provide this service. This is a critical area, that requires a long term, stable funding commitment. In most states with a successful industry, aquaculture is viewed as a form of agriculture, and has a genuine Cooperative Extension or Sea Grant commitment. Two statewide aquaculture Extension positions have been recommended by growers.

Recommendation: One FTE Aquaculture Extension Specialist at the University of Massachusetts Amherst, specializing in closed system fish production and One FTE Aquaculture Extension or Sea Grant Specialist at University of Massachusetts, at Dartmouth, specializing in marine species. Some coordination with the Northeast Regional Aquaculture Center (NRAC) at UM Dartmouth would also be valuable.

University Based Training

Although there is considerable interest in aquaculture, there are no formal training opportunities in Massachusetts at this time. There are no significant freshwater aquaculture degree programs at any University in New England. The state should develop an organized plan for training programs for aquaculture specialist and technologists. Currently many institutions are competing for limited dollars to set up aquaculture departments. The University of Massachusetts at Amherst should be the lead institution for fresh water training. The Animal Science Department is well suited with a foundation in genome mapping and husbandry practices to host the aquaculture program. The University of Massachusetts Dartmouth should be the lead for marine programs. There should be associates degrees in aquaculture technologies as well as four year and graduate degrees. It is anticipated that at least three or four positions would be required to create a nucleus for a significant program. problem solving. The result is a more successful industry.

> *Comments about recirculating systems: "I do not see the growth of the industry in Massachusetts, without a large commitment to technical schools, research, and a large and well-trained Extension Service. In this regard aquaculture is no different than agriculture. All that was done to create a successful agricultural program in Massachusetts needs to be reproduced for aquaculture."*
> John Reid, Bioshelters, 1995.

Recommendation: **A Memo of Understanding (MOU) should be developed between all interested institutions so that there can be shared facilities and training opportunities.**

Recommendation: **Develop a degree program for fish production technology at the University of Massachusetts at Stockbridge.** Add to the Fisheries Department at University of Massachusetts, Amherst faculty that would provide the bulk of the training for Stockbridge, as well as a marine program at the University of Massachusetts, Dartmouth.

Recommendation: **Develop a public/private, non-profit enterprise, in conjunction with the University system.** Not only would this provide a research, demonstration, and training site, but also be financially independent in the long term. Demonstration facilities would be useful for both freshwater and marine systems. Funds generated would be recirculated through the system.

Recommendation: **Require that some form of training or credentials be held by applicants as part of the initial licensing.** In Germany, for example, applicants go through a two year training program as a requirement for their license. This would be useful here as well, preventing business failures due to lack of understanding. This program includes business management training, as well as aquacultural production training. The license can then be granted at the completion of the program, or to individuals that can prove an adequate experience base. This ensures that all growers have at least a base line knowledge of production technology, business management, marketing, as well as information sources to handle complex problem solving. The result is a more successful industry.

Appendix I.

Fish Health Concerns and Recommendations

Position Statement on Fish Health Issues

There are a number of fish disease regulations in the Northeast region that effectively prevent aquacultural commerce (e.g. the "New England Salmonid Health Guidelines"). Regulations vary between the states, some appear to violate interstate commerce rules, and the regulations cause inoperably high expenses to producers, often resulting in the prevention of interstate commerce because of the expense involved. At the same time, these regulations are written and enforced by agencies that do not necessarily have the interests of private aquaculture in mind. Regulations are written and adopted with no thought to their impact on industry, and this has led to serious economic ramifications for the aquaculture producers in New England.

A sensible and practical disease management strategy is needed; one that is realistic in terms of providing disease protection to the region, without unnecessarily preventing interstate aquacultural commerce. For example, current fish disease regulations may restrict the movement of fish into areas where the disease of concern is already endemic, or where locally reared fish are allowed to be stocked without restriction. The regulations do not entirely prevent the spread of disease, but have effectively impeded the development of aquaculture.

Finally, fish disease certification in the Northeast is extremely expensive for the grower. Federal fish disease diagnostic and certification services are not available in certain regions of the country (the Northeast, Region 5), while fish farmers in other regions are provided such services as they are needed, at no cost. Federal fish health services should be equally available to all farmers, regardless of state or region.

Similar problems have been acknowledged by growers throughout the Northeast, representing the Massachusetts Aquaculture Association, New York Aquaculture Association, Maine Aquaculture Association, New Hampshire Aquaculture Association, Pennsylvania Aquaculture Association, the U.S. Trout Farmer's Association, as well as the National Aquaculture Association. The above listed groups agree with and support the following draft USTFA adequately addressed by the existing policies. Mutually acceptable guidelines are needed, guidelines that work from a regulatory perspective without strangling the development of an emerging industry. Regulations should be consistant, coordinated, and fair, to ensure that they promote good fish health, rather than impeding aquaculture development and expansion.

Each of the Region 5 Aquaculture Associations unanimously endorse the following concepts:

1. That the USFW Service, Region 5, expand its fish health services throughout the region, at least to the extent that they are available in other regions of the United States, and that such services remain available until a permanent national strategy for fish health is adopted.

2. The Aquaculture Associations agree completely with the recent USFWS draft issue statement on culture system management, that ''culture management methodology will replace a disease-free approach to fish pathogen control''. This approach should be at the core of any national fish health plan, but is not the current focus in Region 5. This position is in full accord with the new mission statement developed as a National Aquatic Animal Health Strategy by the Joint Sub-committee on Aquaculture, April 1992.

3. In the interim, as a modification to the existing fish health policies, we fully endorse the following draft USTFA fish health policy statement, dated 8/2/92.

USTFA FISH HEALTH REGULATION POLICY STATEMENT

Current fish health regulations and policies were developed by wildlife and fishery resource agencies prior to the recent growth and development of aquaculture, and before recent technology for detection of fish disease organisms. The United States Trout Farmers Association (USTFA) recognizes that a healthy wild fishery resource is vital for aquaculture and is especially beneficial to the recreational industry. A thriving trout industry can and must be compatable with a healthy fishery resource; therefore, USTFA supports public fish health policies and regulations that do not needlessly restrict commercial fish farmers.

This USTFA Fish Health Regulation Policy Statement identifies several problem areas, along with USTFA recommendations to help solve those problems.

1. **PROBLEM.** Fish disease regulations vary among states, within drainages, within and among regions of the Fish and Wildlife Service (USFWS), and such regulations change from year to year, thereby making it difficult for private aquaculturists to plan and conduct commerce.

USTFA POSITION Involved agencies must strive for consistancy in regulations by using regional and drainage compacts, national plans and strategies, and the leadership and resources of the USFWS, USDA, NASDA, IAFWA, USTFA, NAA, and others to develop a workable system of fish disease regulations that are national, regional, and drainage oriented. Such a system should have not only minimum, but also maximum standards for diseases of concern. Industry must be on all committees, boards, or other fish health policy making bodies.

2. **PROBLEM.** Fish disease regulations, if not judiciously written and administered, may needlessly restrict interstate commerce.

USTFA POSITION Prior to implementation of fish disease regulations, regulatory agencies be required to obtain a ruling from the justice department that such regulations do not violate interstate commerce rules.

3. **PROBLEM.** Fish disease regulations may restrict movement of fish into areas where the disease of concern already is endemic or where locally reared fish are allowed to be stocked without restriction.

USTFA POSITION Prior to inclusion of a disease of concern in regulatory restrictions, regulatory agencies must show that the disease is not endemic in areas where importation of that disease is restricted. Local and in-state facilities, public or private, must be subject to the same restrictions as importers.

4. **PROBLEM.** Fish disease regulations have, in some cases, imposed arbitrary geographic embargoes with no provision for fish movement from embargoed areas.

USTFA POSITION Geographic embargoes must include provisions that enable fish or facilities from the embargo area to be inspected and fish be allowed to be imported from the embargo area upon reasonable certification. This procedure must not violate interstate commerce rules.

5. PROBLEM. Fish disease regulations are very expensive and cumbersome to administer, and fish disease regulations require costly certifications.

USTFA POSITION Controllable diseases or diseases with minimal economic impact should not be regulated. The only diseases warranting regulations are: a) diseases that are uncontrollable in aquaculture facilities, or b) diseases that cause catastrophic losses in aquaculture facilities, or c) diseases proven to cause significant fish health problems in the wild.

6. PROBLEM. Federal fish disease diagnostic and certification services are not available in certain regions of the country, while fish farmers in other regions are provided such services as they are needed at no cost.

USTFA POSITION Fish health services must be readily available, at little or not cost, to all fish farmers so that they may comply with regulations. Federal services must be equally available to all fish farmers, regardless of state or region.

7. PROBLEM. Federal fish disease diagnostic and inspection services have not been available on an equal priority basis for federal, state, and private facilities.

USTFA POSITION Good fish health management must not exclude the importance of the private component of aquaculture. Federal fish health services must be made available to private industry on an equal priority basis as for federal, state and other agencies.

8. PROBLEM. Fish disease regulations have the potential to needlessly restrict the commercial aquaculturist when increasingly sensitive methods for the detection of fish pathogens are used in fish disease certifications.

USTFA POSITION If a pathogen is detected in a location where it has not previously been know to occur, other wild and hatchery populations in that watershed must be screened thoroughly using similar numbers of fish and testing procedures. The potential impact of that pathogen on fish populations must be evaluated .

9. PROBLEM. Fish disease regulations have traditionally been written and enforced by wildlife agencies, and wildlife agencies do not usually include assistance of private aquaculture as part of their mission.

USTFA POSITION Fish disease regulations must be written for the purpose of benefitting public resource values and to assist the development of private aquaculture. The private sector must be equitably represented on all fish health policy making bodies.

10. PROBLEM. There is a perception that individuals who conduct fish health certifications on their own facilities, or agencies that conduct certifications of their facilities have a vested interest in the outcome of those inspections, and may not perform an impartial inspection.

USTFA POSITION Fish health inspections and certifications should be conducted by impartial outside agencies or individuals that have no vested interest, either as an agency or as an individual, in the inspection results.

Appendix II

Federal Programs

The country is divided into 12 farm-credit districts. Each district contains a Federal land bank, Federal intermediate credit bank and a bank of cooperatives.

Federal land banks make loans with terms from five to forty years. These loans are secured by first liens on farm and rural real estate. The credit extended to one borrower may at no time exceed 85% of the market value of the property taken as security.

Federal intermediate credit banks provide loan funds to production credit associations, and they discount notes of eligible borrowers given to certain other institutions that finance producers. Terms for aquaculture loans are typically up to 15 years.

Banks of cooperatives serve marketing, supply and service cooperatives. They require that 80% of the voting control of the cooperative remain in the hands of producers. 50% of the business must be done for or with its members.

USDA Farmers Home Administration (FmHA):
Private development and operation, economic emergencies.

USDA Federal Crop Insurance Corporation:
Crop insurance

United States Department of Interior: Bureau of Indian Affairs
Capital construction funds for tribal enterprises.

United States Department of Commerce, Small Business Administration:
The SBA makes guaranteed, immediate-participation and direct loans to aquaculture operators. SBA loans may be used for purchase and improvement of land or buildings, construction, machinery and equipment, operating expenses and refinancing of debt. Disaster loans also available.

Economic Development Administration (EDA)
Operating and development funds

Farmers Home Administration (FHA)

Loans may be used for husbandry of aquatic organisms under controlled conditions. Loans may involve feeding, tending, harvesting and other activities involved in raising and marketing the product. Many categories of loan funds are available, including Farm Ownership loans, Operating loans and Emergency loans due to natural disaster.

Farm Credit Association (FCA): Loans to aquaculturists. Typically these associations are user-owned and must absorb any losses. As a result, equity, collateral and operating characteristics are examined more critically in determining credit worthiness. Not typically interested in higher risk ventures.

First Time Farm Buyer Program.

Fees waived for loan initiation for qualified buyer. Major obstacles are typically poor business plans. Co-signers accepted for credit or assignment of other resources, real estate or stocks. Interest rate buy downs and management team support also offered.

Massachusetts Community Capital Fund

Currently funding an aquaculture initiative, this HUD funded program through the Executive Office of Communities and Development (EOCD) offers straight commercial loans typically used for gap financing. Loans are secured, but typically take second or third position behind banks and quasi's. These are usually considered more flexible than banks. Will make high risk, speculative loans.

CDC-FA Revolving Loan Fund National Marine Fisheries

Money for aquaculture development.

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